

MINING WORLD



How Western Nuclear mines uranium ore in this deep pit after scraper stripping ▶ 14

Russians claim new pit-blasting method ▶ 17

Anaconda improves Montana plant ▶ 20

First report on Nepal's mineral deposits ▶ 22

USA and Canada must mine gold & silver ▶ 26

APRIL 1961



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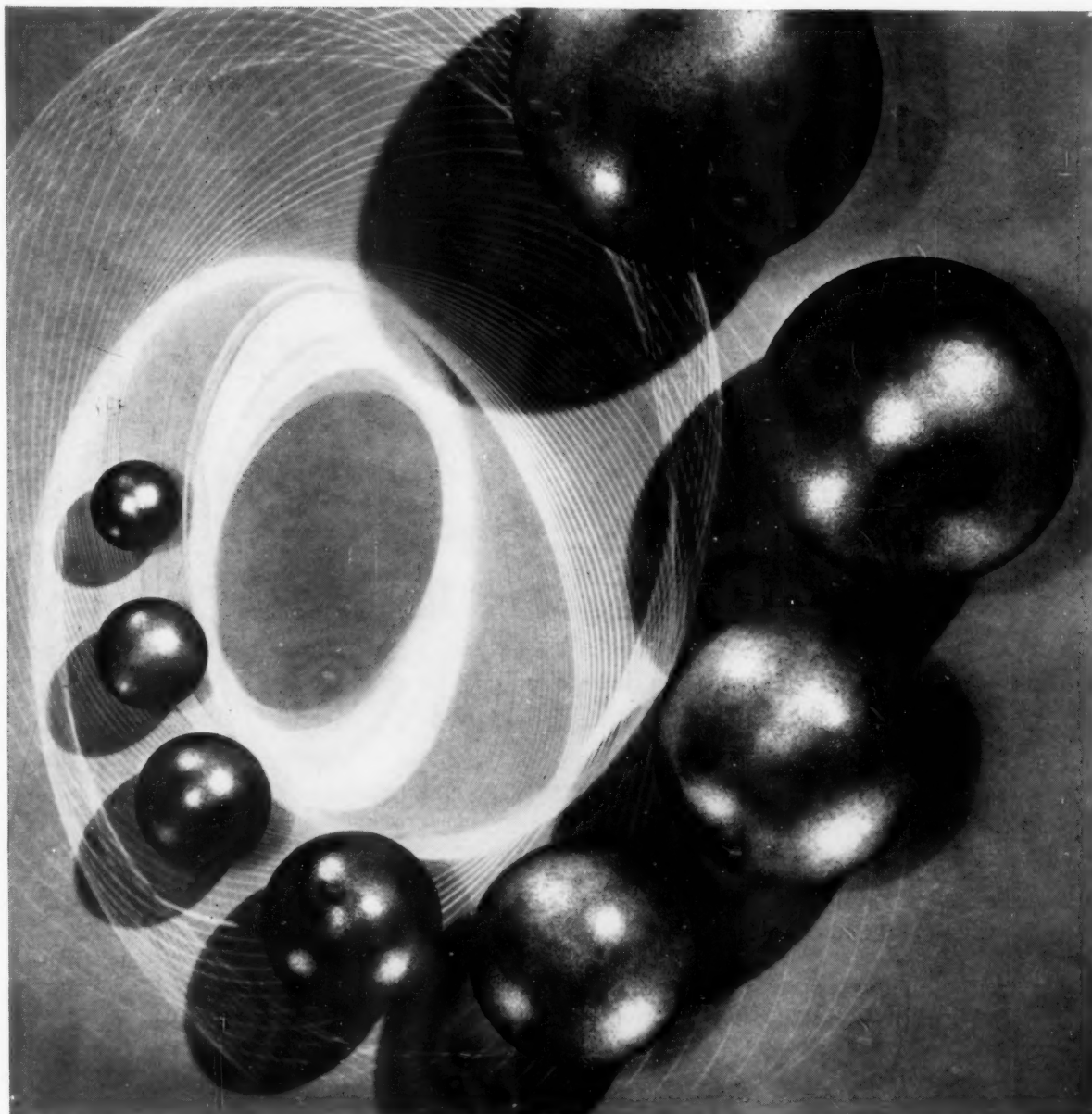
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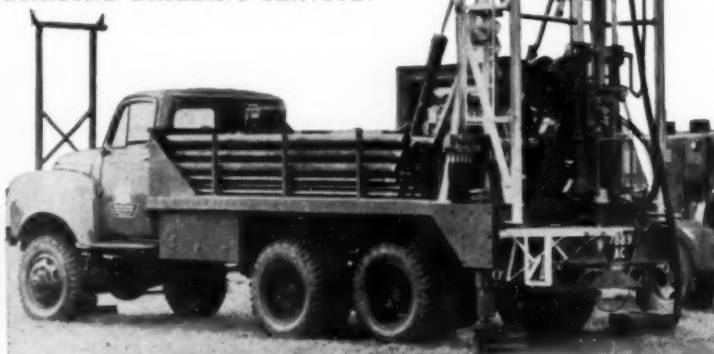


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GRAB SAMPLES from the mail

Shaft Cost Versus Size

Dear Sir:

The article entitled "How Rotary Drilling Speeds Shaft Sinking" in your January issue is interesting and informative, to the extent that specific problems have been solved by application of the drilling methods described. However, some of the conclusions relative to comparisons with costs of excavated raises and shafts, drawn from the figures as given in this article, are open to question. I believe some purpose might be served by pointing out the errors.

When speaking of mine shafts it is, of course, usual to think in terms of finished and usable inside areas. The holes described are actually 35 inches inside diameter, or 6.68 square feet. Total average cost of these holes, including lining, appears to be \$74.00 per ft., for a cost per cubic foot of effective space of \$11.00. Estimated, but not actual, cost for a 47 inch I. D. hole is stated to be \$92.00 per foot, or \$7.70 per cubic foot. A 7 foot I. D. shaft is mentioned as being feasible, but no estimated costs are given. While it can be assumed that the cost per cubic foot will be reduced as size is increased, in common with experience in conventionally excavated shafts, there are problems inherent in drilling which may not allow too great a reduction, especially at the greater depths and harder rocks normally encountered in mine shafts. Weights of tools and casing will approach a practical maximum; and the actual drilling action of the Tri-cone bits and the pumping of sludge will remain substantially constant regardless of hole size. Weighing the various factors involved, it might be hoped that costs per cubic foot as low as \$5.00 could be attained for a shaft in the range of 7 foot I. D., assuming that the 1/2 inch casing would still be adequate.

The statement is made that the costs per cubic foot of the rotary drill holes as described are the same, or less than, costs of a conventionally excavated 5 by 9 foot ventilation raise in Ambrosia Lake. There is a very substantial error here, since ventilation raises have been completed in the area for far less than either \$11.00 or \$7.70; for \$2.00 per cubic foot, to be fairly exact.

Proceeding to conventionally excavated shaft costs, it happens that 7 foot I. D. is about the smallest circular shaft which can be sunk with any efficiency at all by conventional methods. Such a shaft has been sunk in the Ambrosia Lake area for a total cost in the range of \$3.50 per cubic foot. Larger diameter concrete-lined vent shafts are being sunk at considerably lower cost per cubic foot in other areas, in the range of \$2.00 for a 12 foot I. D. shaft and \$1.60 for 18 foot I. D. Costs in South Africa, where volume of work and standardization of

continued on page 40



MINING WORLD

..... including the Export Edition, WORLD MINING

April 1961

VOL. 23, No. 4

Major discoveries of copper in Arizona, zinc in New Mexico, ilmenite-magnetite in New York, and lead and iron in Missouri were reported and discussed at the annual meeting of the AIME in St. Louis, Missouri 13

Western Nuclear's Frazier-Lamac open pit uranium mine in Wyoming's Gas Hills is main source of ore for company's enlarged mill. Stripping was at rate of 900,000 cubic yards per month 14

First International Mining Symposium held at Missouri School of Mines. Speakers from 10 countries discuss rock mechanics and blasting 17

Anaconda installs new equipment and new techniques at its Anaconda Reduction Works to increase copper and zinc recovery at lower cost 20

Nepal, a remote country in foothills of Himalayas offers modest opportunities for mineral production as modern mapping and prospecting are started in this ancient land 22

Canada and the United States must mine more gold and silver. Nine reasons why and recommendations to Congress to make gold mining more attractive in the United States ... 26

WHAT'S GOING ON IN MINING

DEPARTMENTS

Drifts and Crosscuts	5	Newsmakers in World Mining	38
Capitol Concentrates	7	Metal and Mineral Prices ...	39
Production Equipment Preview	34	Mining World Advertisers ...	52



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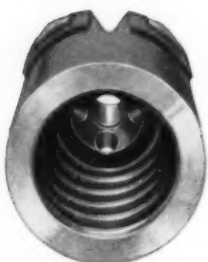


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Study U₃O₈ Problems

Early this year a group of uranium mining and milling firms organized the Uranium Mining and Milling Committee to study the increasing uranium ore problems and promote activities beneficial to the industry. This is good news, and a step forward.

The uranium industry of the United States got off with a bang with the Manhattan Project and the first atomic explosions in the mid-1940's. Then followed a boom period of frenzied exploration, fast mining, and high confidence.

However, by 1960 government cut-backs and slow development of new industrial uses for atomic energy created an oversupply of uranium raw materials. This situation has fast become a serious problem for the growing industry which now has an annual output of nearly 18,000 tons of U₃O₈ valued at \$8.00 to \$9.00 per pound. Also, large surplus stocks of "defissioned" uranium for which there is practically no use have been built up by the government. In time this stockpile will create a major financial headache unless some economic outlets can be found.

The Committee, a satellite unit of the Atomic Industrial Forum, Incorporated, will study short and long term needs of uranium in the United States and abroad. They will also study non-nuclear uses, disseminate information on safety practices and possible hazards in mining and milling, as well as keep watch on regulations and legislation which may affect the uranium market.

Thus it would seem the Committee has a tough job cut out for itself. However, since it represents about two-thirds of the uranium mill output in the United States and includes the giants of the industry, we are confident their important objectives will be achieved.

Special Issues Coming

Spring is here, and just around the corner is the publication of MINING WORLD's annual Catalog, Survey and Directory Number.

This mammoth volume has become a standard reference book for the mining industry, and is again packed with useful information, both technical and statistical. Besides a resumé of the recent scientific advances made in all fields of the industry, there are—the comprehensive metals and mineral review—1960 production figures—reports on mining activities at United States mines—handy Ore Buyers' Guide—and the concise Index of Equipment and Manufacturers. Your copy of the Yearbook will soon be ready . . . look for it.

The coming June issue of MINING WORLD is to be a special treat for management, engineers, and miners interested in saving time and making more profits. "Computers and the Minerals Industries" is the important subject to be covered in some 20 editorial pages. The practical applications of electronic computers to recurrent problems in exploration, mining, ore beneficiation, and metallurgy will be detailed. Case histories, and data on how mines of all sizes can take advantage of these high-speed machines will make important reading for all.

MINING WORLD's annual Catalog, Survey and Directory Number, and special June report on electronic computers are two issues you won't want to miss.



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GOVERNMENT ACTION AND REACTION AFFECTING MINING



Lead-Zinc Quota System Under Detailed Study By the Interior Department . . .

The Interior Department is making an exhaustive study of the effect of the Eisenhower lead-zinc quota system. There is no doubt but that the State Department will be consulted before any conclusion is reached or a report issued. Also, it is very unlikely that the report will advocate discarding the quotas in

favor of tariff increases. Secretary of the Interior Udall held an informal conference late in February with Congressional Representatives from lead-zinc mining states and also with representatives of mining and smelting groups. These latter groups appeared to be encouraged by President

Kennedy's approval of a raise in tariffs for imported bicycles. However, they should remember that many more countries are affected by lead and zinc controls and tariffs, and that their economies are more greatly involved with lead and zinc, than is the German economy by bicycle exports.

Attempt Being Made for Reinstatement of Domestic Manganese Program . . .

Senators Hayden, Mansfield and Metcalf are making another try for reinstatement of a domestic manganese program on the basis that it ended about two years ahead of schedule.

There has been a wide misunderstanding of the terms of the old manganese purchase-program. It was to terminate at a certain date or when the prescribed number of units had been delivered. Some producers, in an attempt to get everything possible from the program, accelerated their deliveries so that it finished much sooner than originally expected. However, the wording of the

regulation was clear.

With high-grade manganese imports selling at around \$1.00 per unit, domestic producers are unable to compete. According to many authorities, a subsidy of \$1.00 per unit would have to be paid by the government in order to support substantial domestic production. The national stockpiles are said to contain a large quantity of metallurgical-grade manganese in excess of what OCDM believes to be necessary under present national defense planning formulas. In addition, there is in inventory more than a million tons of low-grade ore which defense

planners have not thought worthwhile up-grading. The chances of setting up a new, similar program by the government therefore seem pretty dim. Our domestic plants and mines are shut down and in many cases the plants have been dismantled. Only a very brave operator would go into business without a long-term program and the proposed two years would not be sufficient inducement, especially if funds could be cut off in any fiscal year. But the attempt on the part of Senators Hayden, Mansfield and Metcalf will at least point up the problem of our defunct domestic manganese industry.

Two New Plans Offered by Senators to Encourage Domestic Gold Production . . .

Senator Clair Engle of California has introduced S. J. Res. 44 which is in effect, a premium price plan for gold mines. The "incentive payments" he proposes would be determined by the Secretary of the Interior on a mine-to-mine basis, the highest payment not to exceed \$35.00 per ounce. The plan would be suspended automatically when the United States gold reserves equal or

exceed \$23,000,000,000. As the bill carries the usual authorization to appropriate the necessary funds, the subsidy would operate on the hazardous basis of depending upon the House and Senate appropriations committees furnishing the money upon a year-by-year basis. Under any circumstances the plan is to terminate five years after its approval

by the President. Representative Berry of South Dakota has introduced H. R. 3636 to raise the percentage depletion for gold production to 23 percent. This would benefit Homestake and the few other gold mines yet running, but it does not seem likely to cause a new gold rush even should the bill pass.

Senators Mundt and Case have introduced the same bill as S. 758.

Message on Gold Situation Meets With Universal Congressional Approval . . .

President Kennedy's message on the gold situation seems to have been favored with almost universal approval by the members of the Congress. It must have been a little shocking, however, to those who had been buying gold hoping for profits

from a sharp increase in price to note that the President re-affirmed his intention of maintaining the \$35.00 an ounce monetary price, saying: "Those who hope for speculative reasons for an increase in the price

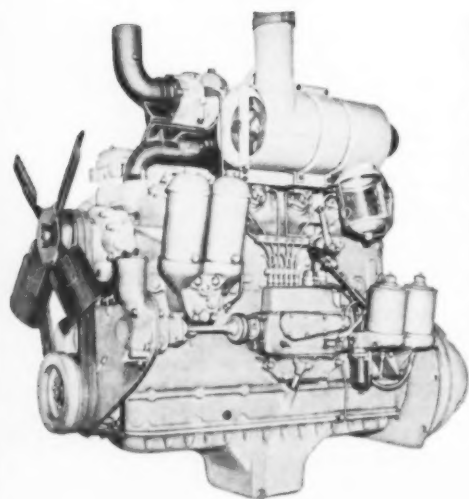
of gold will find their hopes in vain." Also those who are promoting various bills to increase tariffs on metals, minerals and various manufactured products were not encouraged by the statement that "A return to protectionism is not a solution."

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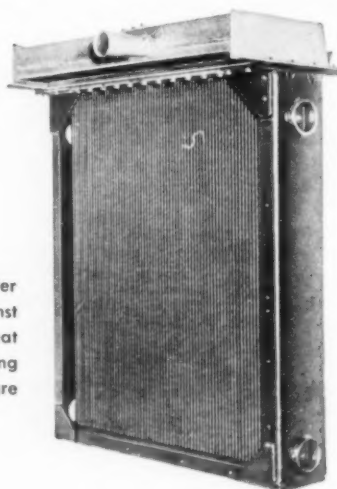
From air intake to new fixed drawbar —from day-to-day dependability through year-in, year-out durability—new strength, new performance protection, new work capacity are built into the new TD-20. Check and compare the advantages of International turbocharged Diesel power, teamed with beefed-to-match new transmission and final drive

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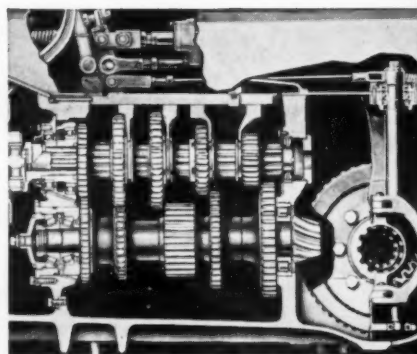
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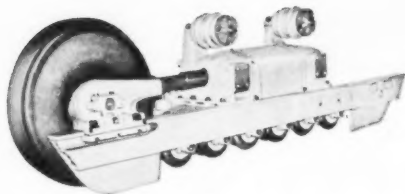
Heavier shafts, more rugged gears, and roller bearings of greater capacity are provided—to carry increased hp and add thousands of hours to working life of power train components. New transmission oil pump circulates and filters life-guarding lubricant. New "short-travel" levers add operating ease.

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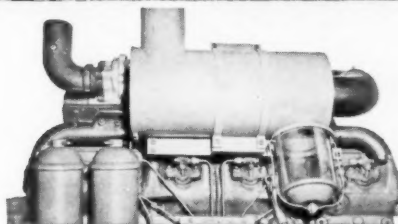


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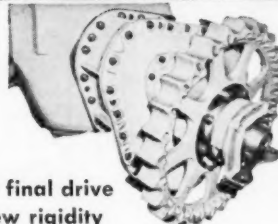
New Undercarriage Strength and Protection

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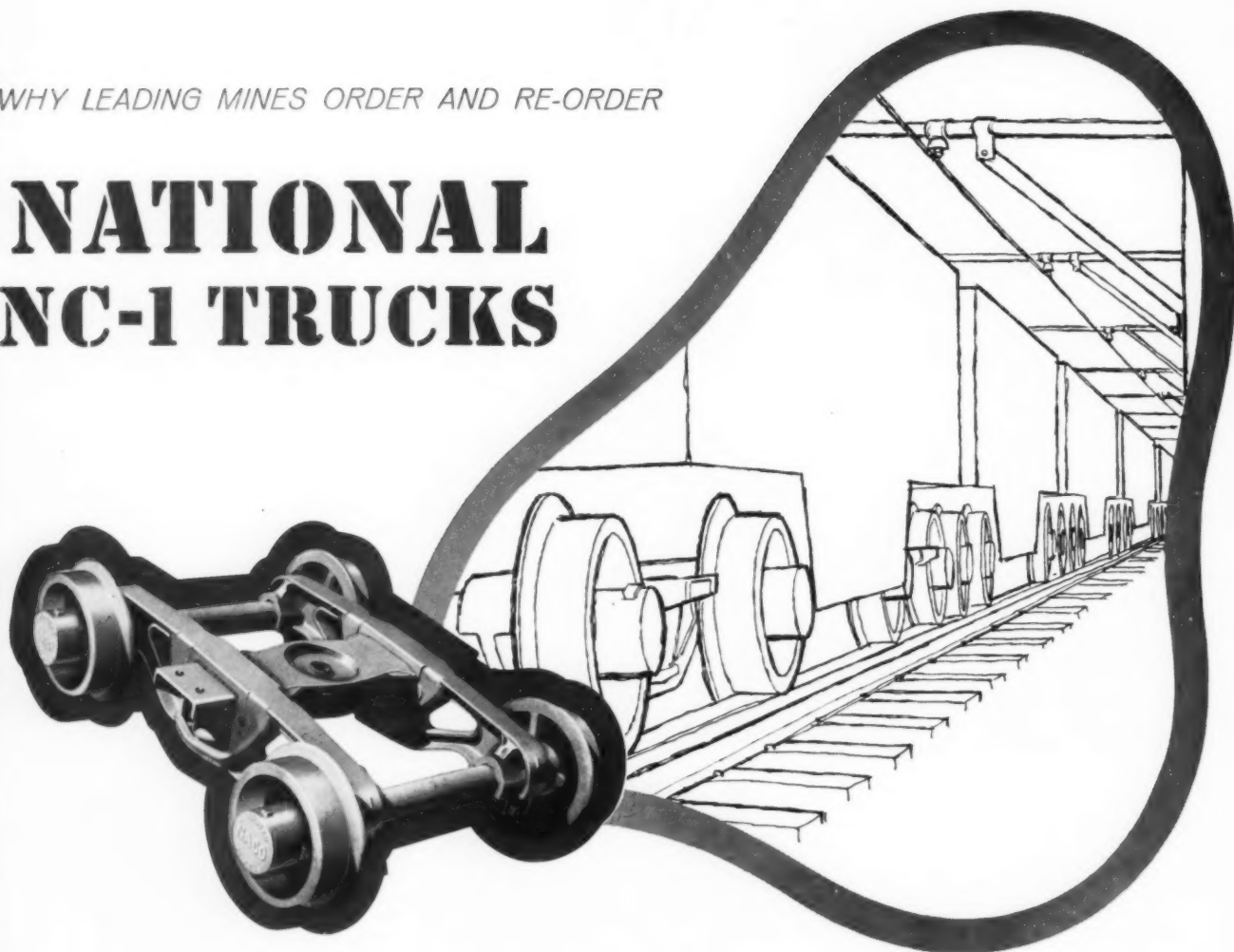


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Exploration News Dominates AIME Convention

A quiet feeling of mining optimism was the impression gained from talking to scores of industry people at the annual convention of the AIME in St. Louis, Missouri late in February.

The key indicator appeared to be new business and increasing requests for bids reported by several drilling contractors. The search for unknown deposits and extensions of those known and/or mined is always a key to the future of mining.

From all reports it appears that St. Joseph Lead Company, American Smelting and Refining Company, Bear Creek Mining Company (Kennecott), National Lead Company, and American Metal Climax, Inc., have at least 10 ore bodies on which mines can be developed. Here's only a partial list of exploration and development talked about in St. Louis:

Headlines were made by National Lead Company's announcement that a minimum number of diamond drill holes following geophysical prospecting had outlined a major extension of the ilmenite-magnetite Sanford Hill ore body at Tahawus, New York.

Arizona keeps in the exploration news with more than 150 geologists

of more than 30 companies seeking ore. Duval Sulphur and Potash Company's recent announcement of a copper-molybdenum discovery of major magnitude is Ithica Peak, north of Kingman. Kennecott Copper Corporation drilled the area about ten years ago. Now Duval's 65 churn and diamond drill holes outline a deposit for open-pit mining with a favorable stripping ratio. Detailed geologic mapping played a key part in this discovery—Duval's second in less than ten years.

Zinc exploration in the joint venture of American Zinc, Lead and Smelting Company and Peru Mining Company at the Kearney and Pewabic mines near Hanover, New Mexico, has been successful. Several hundreds of thousands of tons of ore have been found by underground drilling and raising. One block is of very high grade—40 percent.

ASARCO is also drilling for open-pit copper ore in Nevada.

Major United States copper companies and a Swiss company are most active in Puerto Rico drilling for copper-gold.

Missouri's exploration rush shows

no sign of slacking. There are reported to be over 100 drills at work. Eminence is the key point, with claiming and leasing play moving westward, and to the east, too. Kerr-McGee Oil Industries, and Canada's Consolidated Mining and Smelting Company are joining the other big companies.

Bee Fork is busy as a bee, as American Smelting and Refining Company concentrates on drilling what looks like several major lead ore bodies. A trailer village has been set up, and a large geology and core warehouse built. A major short wave radio system connects all geologic vehicles, field offices and drills with headquarters in Ironton. Long-time company geologists have been transferred from the Salt Lake City, Utah, office to help accelerate the program.

Missouri's lead boom can only quicken. Drilling will continue, more new mines will be developed by several companies.

The engineers who came to St. Louis for the AIME convention "were shown" that Missouri's New Lead Belt can rival its famed ancestor.

New Mine Will Raise LKAB Output to 24,000,000 Annual Tons

The Leveaniemi orebody, where test mining began last summer, will be the first mine put into production by LKAB Mining Company in its most recent project—full-scale development of a third major iron ore district in Arctic Sweden. The new area, located along the main road between LKAB's (Luossavaara-Kiirunavaara) Kiruna and Malmberget operations, is in the Svappavaara district where reserves of iron ore, some of it high-grade, are estimated at over 300,000,000 tons.

Open-pit mining will be used at Leveaniemi, where the ore begins about 12 meters below surface and continues to a depth of 400 meters. It is in an area where copper was mined in the 1600's.

Output during the first year is

scheduled to be about 500,000 tons. Production will later be increased to reach approximately 3,000,000 tons by 1967 or 1968. During the next five years LKAB expects to invest about \$20,000,000 in the mining operation alone.

Combined output of Kiruna, world's largest underground mine, and of Malmberget last year increased to a record 15,700,000 tons. Expansions scheduled by LKAB in the next few years will raise production at Kiruna to 15,000,000 tons per year and at Malmberget to 6,000,000 tons annually by 1965. With the tonnage from the new Svappavaara operations, the total yearly output of the company is expected to hit about 24,000,000 tons before 1970.

To handle the increase, the Swed-

ish State Railways will build a 25-mile electric railroad from Svappavaara to Kiruna at a cost of \$8,000,000. Designed for automatic operation, the line will have an axle load capacity of 25 tons.

LKAB has already begun construction of new port facilities—at Lulea in northern Sweden, since those now used at Narvik, Norway, are sufficient only for the Kiruna output. The new port will be able to handle vessels of 35,000-ton capacity, and loading capacity will be at the rate of 6,000 tons per hour. The port will have automatic storage facilities for 4,000,000 tons of ore, with additional space for another 1,000,000 tons. The port, which is on the most northern end of the Gulf of Bothnia, is scheduled to be completed in 1964.

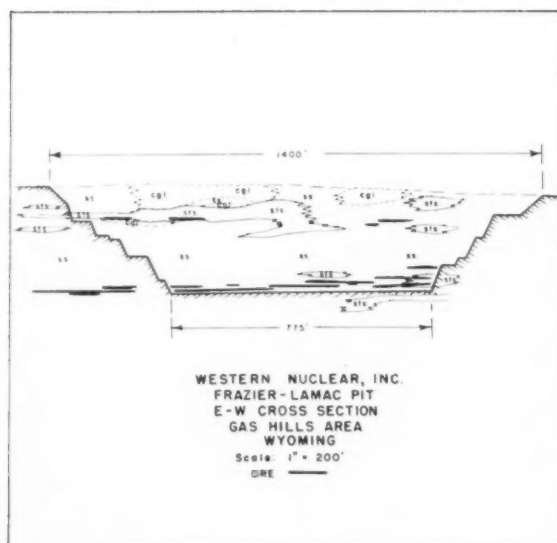


LOADING URANIUM ore in the Phase One section of Frazier-Lamac pit. Phase Two section is beyond equipment to left.

by **John R. Bogert**
Field Editor, *Mining World*

Central Wyoming continues to be one of the richest and most active uranium districts in the United States. And as five mills in the area voraciously demand a steady supply of U_3O_8 ore, the open-pit mines continue to get deeper and bigger.

The Frazier-Lamac pit of Western Nuclear, Inc. now has a daily production of some 4,000 tons, and is over 325 feet deep. This makes it the largest single open-pit uranium operation in Wyoming. Deep ore horizons from this mine now supply the WENCOR Split Rock Mill in Jeffrey City with over 800 tons of ore a day averaging 0.29 percent U_3O_8 . To mine this ore, over 10,000,000 cubic yards of sandy waste were stripped in 1960—the same amount will probably be removed in 1961. Here is a first hand report from the Gas Hills.



CROSS SECTION of pit with thin, elongated ore horizons shown as heavy black lines. Scale is 1 inch to 200 feet.

Ore Requirements

When the Western Nuclear Corporation renegotiated its Atomic Energy Commission contract in 1959, the new contract permitted the company to sell in excess of 12,500,000 pounds of uranium oxide to the government between July 11, 1959, and December 31, 1966. This new contract necessitated increasing the capacity of the existing 400-ton ion exchange mill at Jeffrey City to 845 tons per day—predicated on 0.28 percent U_3O_8 in the mill heads. Previously, enough ore was supplied to the smaller mill by custom shippers; or mined from the company-owned Bullrush and Day-Loma pits, and near-surface mineralization on the company-owned Frazier-Lamac property. With the new mill, however, the company had to develop the deeper and higher grade deposits at its Frazier-Lamac property to get the quality and quantity of ore needed.

Accordingly, the deep development of the Frazier-Lamac pit in the Gas Hills was started in February 1959. By the end of 1960 stripping totaled over 19,000,000 cubic yards, and enough ore was continuously exposed and mined to easily meet the increased demands of the Split Rock mill.

Ore occurs in elongated lenticular pods

Uranium mineralization in the Gas Hills occurs in the sandy Wind River formation of Tertiary age. In general, it is buried under 100 to 330 feet of overburden, and appears to have been introduced by alkaline ground waters rich in carbonates. When these circulating ground waters came in contact with favorable reducing environments, the uranium was precipitated as coatings and cementation of sand grains as well as gouge in minor fracture planes. Occasional inclusions of mudstones in the sand acted as circulation barriers which tended to provide areas of enrichment.

The ore occurs in elongated, lenticular pods of irregular size within the rolling sandstone horizons. Its color



STRIPPING with scrapers and push tractors in north section of pit. This is Phase Three of pit development and should be

completed by late 1961. The stripping contractor removes about 900,000 cubic yards a month.

Push Expansion of Frazier-Lamac Pit

and physical makeup is not very different from that of the sandy rock surrounding it. Radiometrically it can be out of equilibrium in either direction. Autunite is the major uranium mineral in the oxidized zone, and uraninite in the unoxidized. Selenium, arsenic, pyrite, and hydrous molybdenum oxide (ilsenmanite) are associated minor minerals.

At the Frazier-Lamac property two different ore zones occur. An elongated horizon of shallow oxidized mineralization lies 90 to 120 feet below the surface, while a second unoxidized ore horizon lies between 280 and 300 feet below the surface. Between these shallow and deep ore bodies there is only a barren zone of semi-consolidated sand.

Stripping being done in four phases

To expose the ore horizons, a contract for stripping 25,000,000 cubic yards on the Frazier-Lamac property was negotiated with the Maco Construction Company of Rawlins and Casper, Wyoming, in February 1959. This stripping was programmed in five separate and distinct phases. Phase One called for the removal of approximately 6,100,000 cubic yards to uncover the first deep ore in the center section of the property. This initial effort was completed by Maco in November 1959, and mining of the exposed uranium ore was started by Western Nuclear at that time. Phase Two called for stripping an adjacent area of 5,300,000 yards to the South of Phase One. This was completed in early 1960 and mining is now going on in this area. Phase Three is the stripping of 5,100,000 yards of the adjacent area to the north of Phase One. Phase Four is a 4,500,000 cubic yard area. This stripping is being done now and should be completed by early 1961.

All equipment used for stripping is owned by Maco Construction, who remove an average of 900,000 cubic yards on the Frazier-Lamac project a month. Major

equipment consists of 16 model TS-24 Euclid twin-engine scrapers; 6 model TDT Euclid 6-wheel, single engine scrapers; 5 model TC-12 Euclid twin-engine crawler push tractors; and one model 480 Michigan rubber-tired push tractor. The contracted work force consists of 100 men and supervisors. A Western Nuclear supporting force of 10 men handles ore control and pumping.

The maximum stripping depth is 325 feet to the top of the lower ore horizon. Pit walls have been kept at a 1 to 1 slope in the alluvium (down to about 50 feet), and a 1 to 2 slope as the pit is deepened. The overall wall slope including berms is never less than 1 to 1. In



ORE TRUCKS stop at house near pit rim where a radiometric count is made on ore samples by a radiation scaler.



SEEPAGE WATER drains to small collecting pond at pit bottom where 1,400,000 gallons are pumped daily.

spite of rain, snow and wind, walls hold up remarkably well and slides rarely happen. However, for safety's sake, small catch benches have been provided at points of stratigraphic weakness.

In the stripping operations little blasting is required since the semi-consolidated sand is ripped up by tractors. However, in winter when 20° below zero temperatures freeze the ground water, it is cheaper and easier to break up some of the hard material with explosives.

As each phase of stripping is completed and the ore horizon exposed, Western Nuclear equipment is moved in for the actual mining. Equipment usage is determined by the physical

nature of the ore occurrence, radiometric balance problems, or any auxiliary work to be performed. Thus, dragline-truck combinations, backhoe-truck combinations, and shovel-truck combinations may be used in the pit, as well as scrapers when the waste to ore ratio exceeds 3 to 1.

Pit equipment used for loading consists of model 38B Bucyrus-Erie 13½ yard draglines and backhoes, plus model 44 Lima—1 yard draglines and backhoes as needed. Haulage of the ore from the pit to the stockpiles is handled by seven model 91FD Euclid 12 cubic yard rear-dump trucks. Ripping is done with either a model D8 Caterpillar or TD24 International Tractor.

Mining follows a definite daily sequence. Information from previous ore-development drilling pinpoints the "hot-spots" in the pit. Ore control men armed with Geiger counters or scintillators scan the pit floor in advance of the loading units. Ore trucks are then loaded according to the grade estimated by the ore control men who direct ore loading.

Ore trucks proceed to a scaler-sampling house in the pit bottom. Here, a special electric auger drill takes five samples from each truck load of ore. This sample is mixed, cut, and radiometric count taken by a Beta-Gamma scaler. Only 3 minutes are required for this sampling and determination work. The load is then ticketed and assigned to special waste dumps, or to one of four stockpiles as follows:

<i>Low waste</i>	—0.00 to 0.04 percent U_3O_8 (in pit)
<i>Sub marginal</i>	—0.05 to cut-off percent U_3O_8 (on surface)

<i>Stockpile 1</i>	—cut-off to 0.19 percent U_3O_8 (surface)
<i>Stockpile 2</i>	—0.20 to 0.49 percent U_3O_8 (on surface)
<i>Stockpile 3</i>	—0.50 to 0.99 percent U_3O_8 (on surface)
<i>Stockpile 4</i>	—Over 1.00 percent U_3O_8 (on surface)

The four stockpiles normally contain from 5,000 to 10,000 tons. Ore is next loaded by a model 175A Michigan loader into three 80-ton drop-bottom tractor trailer trucks for the 27 mile run to the Split Rock mill. Every attempt is made to keep the grade of shipped ore between 0.25 and 0.30 percent U_3O_8 .

Water in the Frazier-Lamac pit is not a serious problem because of adequate facilities. All rain and seepage from the pit walls drains to a ditch around the bottom pit perimeter, and thence to a sump. Here one or more Flygt submersible pumps are used to pump an average of 1,400,000 gallons per day to Gorman-Rupp 66B booster pumps. For emergencies, and after the thaws and spring rains, two Gorman-Rupp 55M pumps with Chrysler 183 horsepower engines are on a standby basis.

Stripping and mining in the Frazier-Lamac pit is carried on eight hours-a day five or six days a week. However, the infrequent heavy snows and rains during the winter and spring occasionally (30 hours in 1960) shut operations down for a short time.

From humble beginnings in 1955, Western Nuclear, Inc. has grown to become one of the largest uranium producers in Wyoming. And this phenomenal growth will probably be continued. A separate development department has been set up to take charge of future pit expansion. Here, engineers plan for exploratory drilling, mapping, and undertake various engineering studies. The most important of these include plans for future underground mining to reach ore pods beyond the limits of practical pit expansion. An active exploration department combs the countryside investigating promising outcrops and prospects. New methods of mining and ore handling are continually being tried by the mining staff. Thus, through farsighted and progressive policies Western Nuclear, Inc., led by Robert W. Adams, president, and J. W. (Bill) Joyce, manager of operations has become one of the most important uranium companies in the industry.

Staff in direct charge includes Don Ceniz, general mine superintendent; Eric Newman, chief geologist; and Marcel Ceniz, mine production superintendent.

END



RIPPING loosens sandy uranium ore for loading by draglines and shovels. Except in winter when ground water freezes, little blasting is required in the pit.

MISSOURI MINES holds first International Symposium at Rolla; U. S. Bureau of Mines co-sponsors mining research papers presented by prominent speakers from ten countries

Mining research gained a new common international dimension in late February when over 300 engineers attended this four-day tri-lingual symposium.

More than two years of preparation, the expenditure of several tens of thousands of dollars, the financial support of many United States metal and coal mining companies and manufacturers, and the hard work of the Missouri Mines faculty and Bureau personnel made the symposium a success.

There were repeated compliments for the fine organization and attention to details which speeded the long program to completion ahead of schedule, with adequate time for each speaker to answer questions from the floor.

All registrants immediately received a two-volume mimeographed record 2.75 inches thick of all the speeches. Nearly all had been translated into English, but one was in Russian and several were in French.

While English was the official language and was spoken by almost every delegate, all speeches were given in three languages—English, French, and German. Wireless translator equipment with individual ear-phones could be tuned to any of the languages as spoken by the six translators. This system is widely used in Europe, but this was the first mine research and operating meeting to use it.

A limited number of the two-volume proceedings were not used by delegates. If you are interested in a copy, please write for details to Symposium Chairman George B. Clark, Department of Mining Engineering, Missouri School of Mines and Metallurgy, Rolla. The U. S. Bureau of Mines is considering printing the official proceedings.

Synopses of some of the important papers presented at the International Symposium follow on the next two pages.



ENGINEERS adjust and tune their radio receivers as one of the tri-lingual technical sessions gets underway.

Seen and discussed at Rolla . . .

by George O. Argall, Jr., Editor

The personal popularity of the two Russian engineers with other delegates—M. M. Protodiakonov, professor, Mining Institute, U.S.S.R. Academy of Sciences, Moscow, and N. V. Melnikov of the same Institute.

The great exchange of ideas and notes on ammonium nitrate between the Swedes and Americans.

Canada's large delegation of cost-conscious operators, who freely told of their methods in the Parker Hall corridors outside the meeting.

The many comments about N. V. Melnikov's paper on use of an air plug between different sections of charge along its length as "old stuff" to "maybe we had better try that again." One comment was made that, "I think the Russians are sincere in their belief that it's the best way to blast." One western open pit expert said for blasting copper ore the added cost of labor and extra loading time would make this Russian air-powder-air loading too expensive.

The personal pleasure and surprise to both Robert H. Cuthbert and myself to meet again. He was my guide at the Zinc Corporation at Broken Hill, Australia, in June.

The Anaconda Company's research department was present in force to hear, observe, and evaluate the reports.

After Linde Oxygen's Joseph J. Calaman reported on taconite jet piercing performance, Russia's Protodiakonov told him that a jet piercer was used for the quartzitic iron formation at Krivie Rog open pit. Mr. Calaman asked about hole depth, hole size, and performance. From the answers—through an interpreter—it was apparent that Minnesota taconite operators break more ore per piercer in a year than do the Russians.

It was a surprise to hear several French engineers say about their colleague: "He's going to deliver his speech in French. Why, he can speak English as well as you."

Perhaps there have already been too many notes about Russia, but to end on an observation about Russian mining, which summed up many views, "I wish the Russians were as far behind us in space as they are in mining."

RUSSIAN ENGINEERS made special trip to Rolla. Key figures are L to R: V. P. Sokoloff, U.S. Bureau of Mines, Washington, D.C.; N. V. Melnikov, director of mining institute, Academy of Sciences, Moscow, U.S.S.R.; George B. Clark, Symposium chairman, Missouri School of Mines; and M. M. Protodikonov, professor of mining engineering, Academy of Sciences.



SWEDISH SPEAKERS included J. H. Knutson, Atlas Copco, Inc., Carl A. Janson, Sandvik Steel Corporation, and Bertil F. Enoksson, Nitroglycerin Company.

Jet piercing improvements give greater tonnage per machine

Advances in equipment and techniques have increased productivity and efficiency of the oxygen-fueled rocket principle of hole drilling by spalling action. The jet piercing rate is now 5,000,000 tons of taconite per year per machine.

In taconite and jasper, the 6½ inch burner now makes holes averaging 9.8 to 10.9 inches in diameter at a speed of 18.2 feet per hour.

Maximum speed in one hole has been 47 feet per hour; maximum footage for one drill per shift was 276 feet (several moves were made to new hole sites).

Improved burner design, use of more oxygen, and more experienced operators have made these records possible. The result has been lower cost per foot of hole and greater ton-

nage per machine for a lower capital investment.

Ore breakage is now 40 tons per foot of hole with the JPM-3 machine. An improved machine will soon be available as the JPM-4 to reduce costs further.

J. J. Calaman and H. C. Rolseth, Linde Company Division of Union Carbide Corporation.

Slurries packaged in thick polyethylene plastic tubing

The day for the rapidly expanding application of slurries is very near at hand. Slurry (DBA-3) for small diameter holes are pellet or flaked TNT, pellet composition B, and smokeless powder. For drift rounds it

must be packed in 5-millimeter thick polyethylene tubing and formed into sausage-like sections by tying at various intervals. Holes are bottom-primed with dynamite. A better primer would be more desirable.

Packaging for up-holes has not been solved. All other holes require hand packaging.

D. T. Bailey, R. B. Clay, M. A. Cook, and D. H. Pack, Intermountain Research and Engineering Company, Salt Lake City, Utah.

Air spaces improve degree and uniformity of fragmentation

The Mining Institute of the Academy of Sciences of the U.S.S.R. has shown at a mine in hard rock that with charges separated by air spaces in the column, the most intense and uniform fragmentation of rock is obtained when the length to diameter ratio of every section of the charge

is close to unity. There was a 20 percent increase in quantity of rock rubble in finest fraction (up to 20 centimeters in diameter), as compared to quantities produced by ordinary charges. Large size (110 centimeters) was practically zero.

Fragmentation efficiency is augmented by dividing the elongated

charge into several sections with air spaces in between, by a simultaneous explosion of the entire charge by means of a detonating cord, and by leaving an air space between the top of the charge and the stemming.

N. V. Melnikov, member of the Academy of Sciences of the U.S.S.R., Moscow.

Ammonium nitrate and slurry use will grow if used properly

From reports given in several papers, interest shown by many underground operators, and personal talks with Swedish, Canadian, and United States research engineers and operators, it is apparent that the so-called ammonium nitrate-carbon agents and dense blasting agents will find greater use.

Some notes of caution they re-

ported on use were: Ventilation must be good—probably better than with dynamite. Minimum hole diameter is critical. Watch out for wet holes. Be careful of static electricity generated by various charging devices. Look for packaged charges, but other methods of loading have advantages. A lot of development is under way on smaller and simpler

hole loaders.

St. Joseph Lead Company and Monsanto Chemical Company recently pooled their research staffs to develop techniques to use ammonium nitrate-fuel oil mixtures in small diameter underground drill holes in St. Joe's Missouri mines.

Preliminary testing has been favorable for four blasting agents, of



PICKING UP RECEIVING SETS are J. J. Calaman, Linde Division of Union Carbide Corporation, Aviora, Minnesota, and Dennis Robinson, Linde of Canada, Toronto.



FROM FRANCE—K. D. Phan, Bureau de Recherches Géologiques Minières, Paris; George Vigier, Mines Domaniales de Potasie d'Alsace, Mulhouse; Daniel Bedouret, Bureau.

which two are still experimental—the E-3 and E-4 dense ammonium nitrate micro prills (minus-30-mesh, plus-325-mesh).

Best results were obtained in holes with a minimum diameter of 1¼ inches. They must be kept dry, but will detonate with one stick of 60 percent semi-gelatin as a primer. All types can be pneumatically placed, though finely ground material makes

the job more difficult.

All precautions should be taken during loading to minimize generation of static electricity by blowing oiled ammonium nitrate. Ground the placer, coat the hose with anti-static chemical, use shunted electric caps, and blow at moderate pressure. All tests to date indicate no hazard in loading holes with insulated electric cap lead wires when the hole is

primed near the bottom.

Blasting cost savings look impressive with a 16 to 18-cents-per-pound differential in favor of prills. In five years, one-half of St. Joe's underground blasting could be with prills.

By R. L. Bullock, head mining research engineer, St. Joseph Lead Company; Lee Bilheimer, mining research engineer, and J. J. Yancik, senior research engineer, Monsanto Chemical Company.

Sweden develops mixing-loading units for AN and fuel oil

Different types of mixing-loading units for ammonium nitrate-fuel oil have been used at Boliden, Sweden. They are built by AB Agentor, Stockholm. They have a steel mixing drum and a plastic loading hose. Ammonium nitrate and oil are charged into

drum and mixed. Drum is closed and compressed air admitted to drum to blow mixture through hose into bottom of the drill hole. Units are large and heavy. A new lighter type with pneumatic mixing has been developed. It is more reliable in operation.

These units work satisfactorily for large blasts to save money. However, cartridge AN must be used for small rounds. The problem of rapid, low-cost cartridge filling must be solved.

Ulf Henning, Bolidens Gruvaktiebolag, Boliden, Sweden.

Presplitting has advantages in reducing rock overbreak

Presplitting is the establishment of a free surface or shear plane in rock by the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes. Overbreak was thus carefully controlled in dolomite and limestone for the conduits at the Niagara Falls power project in New York.

Holes 2½ inches in diameter, 2 feet apart, and from 12 to 54 feet deep were drilled parallel and vertical.

Four-by 1¼-inch pieces of 40 percent Extra Gelatin were taped on Primacord with center of charges 12 inches apart. Each hole was then loaded to bottom and completely

stemmed with minus-⅜-inch clean stone chips. Stemming was worked completely around the charge by holding the end of the Primacord in the center of the hole and working it up and down. A hundred or more holes were shot at once.

R. S. Paine, D. K. Holmes, H. E. Clark, explosives department, Hercules Powder Company.

How to measure strains in mine rocks with plastic patches

It is possible to make a rock dynamometer by applying a plastic patch to the rock face and thus determining changes of strain on the rock. These photoelastic plastic patches are cemented to clean rock surface. They are specially compounded ethoxylene resins, and can be cut to any shape; circular is the simplest

shape. Maximum thickness should not exceed 0.125 inches. Strain measurement readings are taken by observing the plastic under polarized light with analyzer. Thus a simple linear parallel polariscope is formed, so that the bright field is clearly visible to the eye. Direction of maximum natural brightness is the direc-

tion of principal strain in plastic and hence, the rock.

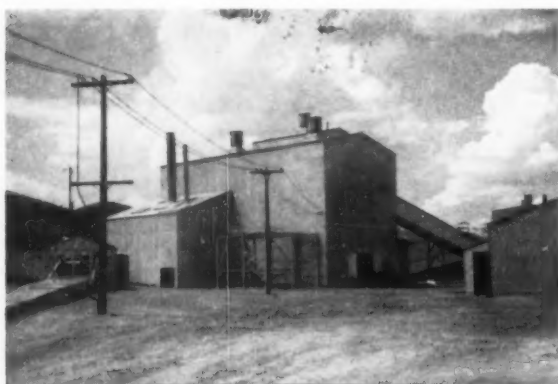
By this method the real direction and magnitude of rock shears can be determined. In flat backed stopes the bolting pattern can be changed to resist maximum direction of movement.

C. L. Emery, Mining Engineering Department, Queen's University, Kingston, Ontario, Canada.

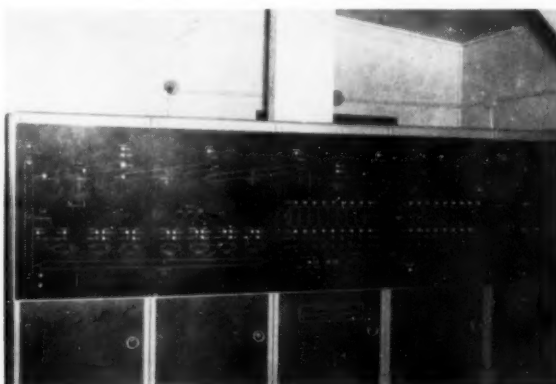
ANACONDA reduction works

To keep competitive in the world copper and zinc markets, The Anaconda Company is continually improving its concentrating and smelting facilities to permit higher recoveries of metals from ores treated. In 1960, a \$6,000,000 replacement and modernization program was initiated at the Anaconda Reduction Works, which should be completed by the end of 1961. This large investment in-

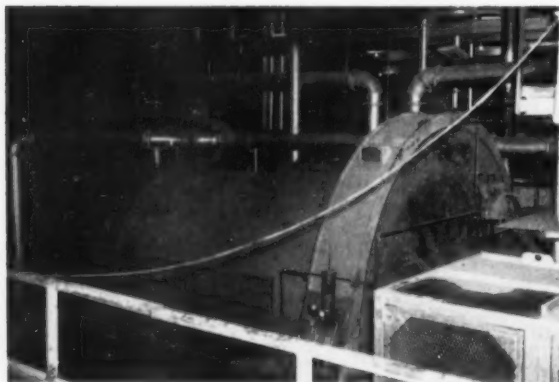
cludes important improvements in both metallurgical techniques as well as the installation of new equipment. However, this current program is only one of the bigger steps in the continuing efforts of the company to improve its position in a highly competitive industry. These pictures show a few of the highlights, as well as other recent developments at Anaconda, Montana.



NEW CRUSHING PLANT at East Anaconda was completed last year. Butte ore is dumped by dual tipples, crushed by 20-inch gyratories and 7½-foot cone crushers to pass 1½-inch screens. Six storage bins have capacity of 20,000 tons.

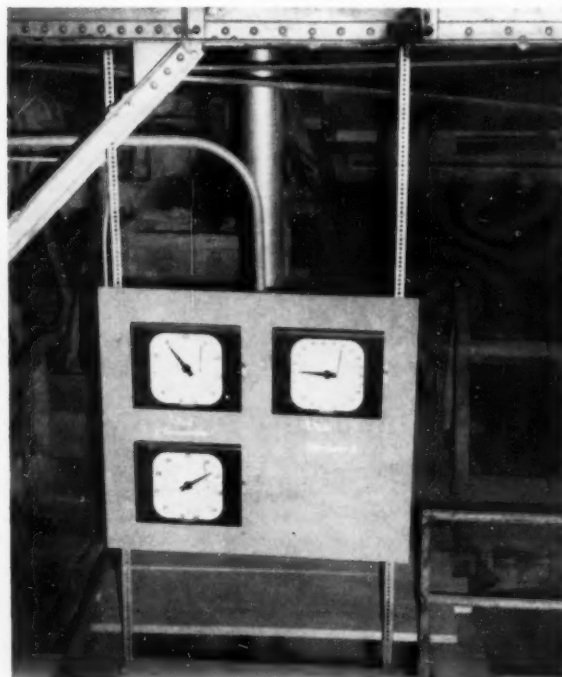


ELECTRONICALLY controlled conveyors, carrying ore one mile to concentrator bins, are operated from this control board. Electronic probes at transfer points, feed belts, and bins keep operator advised on system efficiency.

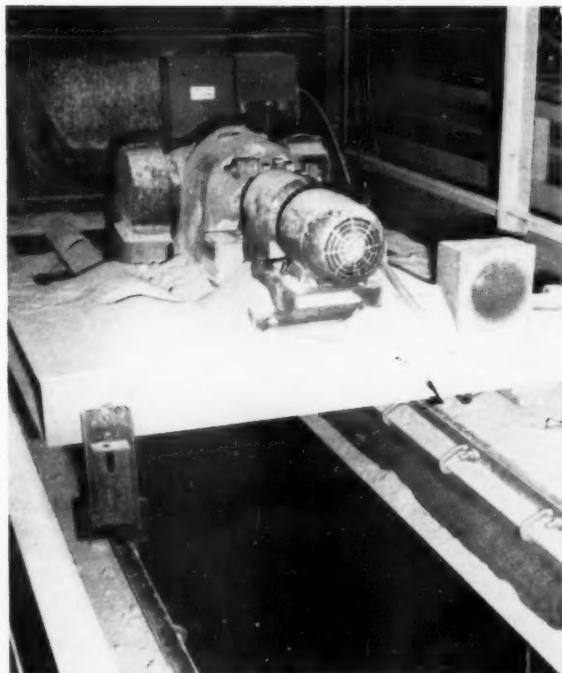


REGROUND MILLS have been installed to give a finer grind and improve the concentrate grade. The three new 9- by 12-foot Marcy ball mills cut into the flotation circuit between the rougher and cleaner cells.

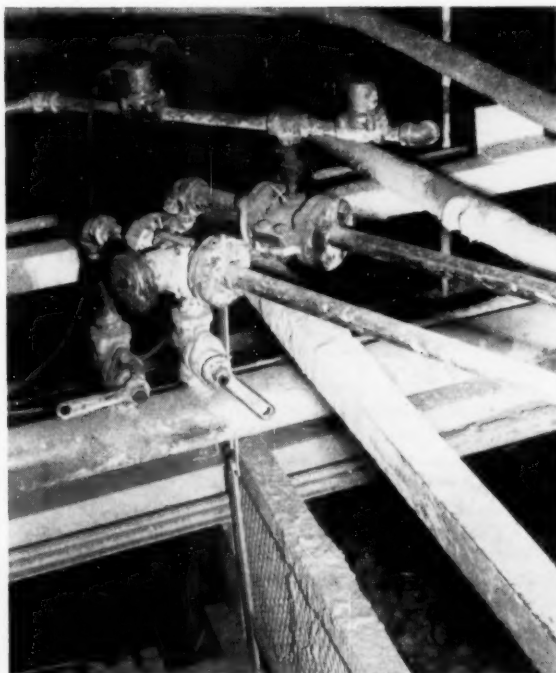
COPPER ASSAYS take only two minutes with the new Quantrol x-ray fluorescence analyzer. This apparatus continually samples heads, tailing, and concentrate pulp streams in concentrator giving mill operator a greater degree of metallurgical control over his flotation circuit than ever before. See Mining World, December 1960, pages 32-34.



continually improves overall efficiency



ORE is dumped into one of 17 concentrator storage bins from shuttle belt at rate of about three tons a minute. Belt automation permits easy blending of various ores. Electronic probe is seen in bottom right corner.



REMOTE MANUAL control line system to control milk of lime addition in a rod mill circuit to hold a constant alkalinity is a recent innovation in the flotation mills. The special valve and timer ease job of mill operator.



SLAG DISPOSAL system consists of a series of conveyors traveling some 250 feet a minute, that discharge on to a swivel slinger, traveling 2,500 feet a minute, which throws the granulated slag about 50 feet horizontally.

NEW TAILING and water recovery system, recently completed, involved installation of a hydro-separator, 370-foot thickener, pump house, and miles of pipeline. Overflow from hydro-separator goes to thickener, waste passes through a 35-inch pipeline to existing settling ponds, and then by ditch to a new pond area in the Deerlodge Valley.

NEPAL

Offers opportunities for modest mineral production as modern mapping and prospecting are started in this ancient and relatively unknown country on the southern slope of the Himalayan mountains

Emerging from centuries of isolation in its Himálayan fastness, Nepal is trying to develop its mineral resources. It is starting from scratch. When the country first opened its doors in 1951, only one mine and one quarry were in operation. Only a handful of geologists or mining engineers had ever been allowed to set foot in Nepal, and nothing was known of its mining industry except that it had once been productive.

Now, several new mineral deposits have been discovered, mapped, developed, and put into operation. The geology of the whole country has been mapped on a scale of 1.0 inch = 25.0 miles. A mining bureau has been founded, housed in a brand-new fully equipped laboratory, and staffed with trained engineers. Several new highways have been built, and many more are planned. The Nepal government has formulated a mining code designed to encourage prospectors and attract foreign investors. Prospects for additional discoveries seem good.

These impressive developments are largely the result of technical co-operation between the Nepal Bureau of Mines and several foreign agencies, although private enterprise is playing an increasingly important role. The chief source of financial assistance has been the International Cooperation Administration of the United States government, which functions through the "United States Operations Mission" in Kathmandu. Starting in 1951, ICA sent a series of mining men to advise the Nepal government on mineral policy, administer the financial backing, and to train the Nepali technicians in field methods. These advisors were, successively: A. V. Corry, R. S. Sanford, S. Walker, J. R. Welch, the

by J. E. O'ROURKE



pictured here in the Kathmandu Valley in 1959. He organized and led many geological prospecting expeditions including those in the Himalayas during his two years in Nepal. He has worked for the United States Steel Corporation in the western United States and for the United States Geological Survey in Colorado, Brazil, Maine, Florida, and Michigan. He has written several technical articles about iron in Brazil and the Himalayas. He is presently a consulting geologist with headquarters at 2115 Haste Street, Berkeley, California.

author, and G. R. Richardson. Special consultants included C. W. Watts, B. E. Ashley and E. Fox. The program was co-ordinated from Washington by W. R. Gage and B. Lockwood of ICA, and L. A. Turnbull and H. Heginbotham of the United States Bureau of Mines.

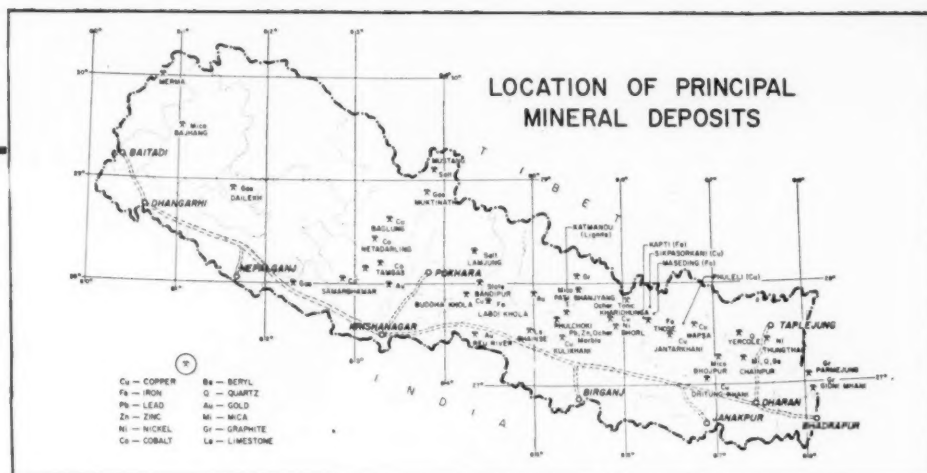
The Nepal Bureau of Mines, founded by Colonel K. N. Rana, now has a well-trained staff: P. B. Malla, director; R. N. Suwal, chief

engineer; C. K. Sharma and D. N. Rimal, mining geologists; G. R. Manandhar, B. M. Pradhan, Y. L. Singh, C. L. Shrestha, and R. H. Khan, mining engineers. R. Upadhyay, formerly a Bureau geologist, is now Director of Industry and Commerce, and Colonel Rana is now Planning Minister. These engineers, all graduates of Indian universities, have received additional training in the United States. They have already done considerable field work on their own.

The Geological Survey of India has undertaken several long-term mapping projects in Nepal. Most of its work has not been released yet, but it has mapped the area around Kathmandu, the Dailekh gas field, and several mining districts. The supervisors were, successively: V. P. Sondhi, (Director, G. S. I., Retd.) M. Nath, S. P. Nautiyal, and S. C. Chakravarti.

The United Nations sponsored a program through which the entire 150,000 square kilometers of this rugged country have been covered by reconnaissance mapping. This back-breaking task was performed by T. Hagen of Switzerland. The work, though primarily academic, will undoubtedly be of considerable use in mineral exploration when published. Significant contributions to the regional geology have been made by geologists of French and Swiss expeditions: A. Lombard, P. Bordet, M. Latreille, A. Heim, and H. Mulli.

Mining companies were virtually non-existent when these development programs began, but two new organizations have appeared recently. The Nepal Mines and Minerals Company, managed by R. D. Koirala of Kathmandu, and backed



KNOWN MINERAL occurrences are located and identified as to type on this map. Also shown are the principal cities and very short but growing road system.

by Nepali and Indian capital, has opened up a new talc mine employing 300 men, at Palung, and has discovered several other prospects. The Rajah of Ramjang, the most active mining promoter in western Nepal, has recently opened up several mica deposits near Silgarhi-Doti, and has been trying to interest geologists to explore his remote corner of the country.

Mining conditions. Nepal is probably one of the toughest countries in the world for field work. The environment changes from tropical rain forest (tarai) to arctic snowfield (himal) in a distance of little more than 100 kilometers. Acclimatization is difficult, and field men report suffering everything from arwal fever to anaerobia.

The extreme relief and lack of roads make transportation painfully slow and costly. Nearly all travel is by foot; the trails are too treacherous for pack animals, even if such were available. Therefore the beast of burden is the coolie, who carries 40 kilograms from 12 to 25 kilometers for about 50 cents a day. All food and equipment must be carried in this way, and several weeks may be necessary to reach a mining district and prospect it, so 30 to 50 porters are needed for most expeditions. Thus transportation costs run at the fantastic rate of \$1.00 per kilometer. Obviously, motorized transport will bring about big improvements in the economy of the mountain region.

The transportation obstacle is offset by some definite assets to prospecting. The entire country is covered by topographic base maps on a scale of 1.0 inch = 4.0 miles in addition to the forthcoming geologic map, and parts of it are covered by

air photographs. The Nepal Bureau of Mines, with its new laboratory and complete line of field equipment, including trucks, jeeps, diamond drills, and bulldozer, stands ready to help companies start new prospects. Mining industry will also benefit from many projects, such as hydroelectric plants, reforestation, aerial tramways, village development, etc., that are being sponsored by various international agencies.

The Mineral Potential. Mining and metal-working were once the major industries of Nepal, but activity was at a standstill when the nation started its modernization drive in 1951. The alpine geologists who made the first appraisal of the mineral potential turned in discouraging reports. Noting the many points of geologic similarity between the Nepal Himalayas and the Alps, they inferred that these similarities included a lack of mineral deposits. Their conclusion now seems to have been too hasty, in view of recent discoveries. The apparent lack of ore deposits in Nepal may perhaps be more a reflection of economic, rather than geologic, factors.

The ancient miners worked only minerals that could be used locally or that could stand the high cost of coolie transport. They mined only where the ore was plainly exposed; they did not gamble on exploratory work. Once the obvious deposits were exhausted, mining ceased. Modern industry, however, uses minerals and metals unheard of by the ancients, and scientific methods of exploration now offer a chance to find concealed deposits.

The new cycle of exploration is now beginning. Most of the western half of the country has yet to be investigated by a mining man, because

attention has been concentrated in the eastern half, where the first roads were built. Lack of transport is the real reason for the seeming lack of ore deposits, as shown by the fact that most of the new mines and prospects have sprung up along the new roads or in advance of them. It is still too early to make an appraisal of Nepal's mineral potentialities, but the rate of discovery in the last few years has made a sharp upturn, and it seems likely to increase as more roads are built.

Geologic setting. Three main geologic zones are generally recognized in Nepal. The tropical plains and foothills are underlain by Tertiary sediments deposited during mountain building: sandstones, shales, and minor marine limestones. Minerals include: placer gold, coal, soda, and probably petroleum or natural gas.

The middle ground, consisting of mountains 1,500 to 3,000 meters high, is carved out of Paleozoic sediments, of which phyllite and micaceous quartzite greatly predominate. Subsidiary rock types include limestone, carbonaceous slate, and iron formation. The majority of the mineral deposits are found in this zone: copper, lead-zinc, iron, cobalt, nickel, talc, ocher, slate, etc.

The high snow-capped Himalaya, which rises abruptly above the middle ground to attain heights of more than 8,000 meters (Mount Everest is 8,888 meters), is built of a thick sequence of Mesozoic sediments in the central and western sectors, but of granitic gneiss in the eastern corner of the country. Only a few small deposits of mica and lead-zinc have been found in this zone so far.

Two types of granitic intrusive occupy large areas of western and northeastern Nepal. They yield de-



MINERALIZED landslide at upper left on Nangre Hill. See how rough the country is that Y. L. Singh, geologist, must cross and climb down and up to reach this prospect.



COOLIES carry all supplies for field party headed by engineers R. N. Suwal and B. M. Pradhan, ex-Colorado School of Mines students. Surface outcrops are good in hills.

posits of mica, quartz crystal, and clay, but seem to contain few hydrothermal deposits, although they may possibly be related to such deposits in the rocks which they intrude.

Mineral deposits. **ALUM**—Aluminum sulphate, formed by the alteration of finely divided pyrite in black, carbonaceous slate, has been mined on a small scale at many places and hauled by porter to India to be sold at high prices as medicine. The more accessible prospects are at Chak Khola and Dandagaon near the confluence of the Sun Kosi and Indrawati Rivers; at a locality near the confluence of the Sun Kosi and Dudh Kosi; and at Labdi Khola near the confluence of the Seti and Sapt Gandaki.

BARITE—A zone 200 meters thick, in which coarsely crystalline barite cements brecciated dolomite has been reported by Heim and Gansser from Badolisera and Balwakot along the Kali River border of India and western Nepal. The area is now accessible by road.

CLAY—High grade halloysite clay, suitable for fine ceramics, results from the weathering of certain granitic intrusives near Kathmandu and Palung. The material at Kathmandu contains only 5 percent clay, but that at Palung is richer and is now being developed by the Nepal Mines and Minerals Company.

COBALT—The area around Tamgas, Neta Darling, and Samar Bhamar in south central Nepal was the chief center of cobalt production. The Samar Bhamar mine (28° 05' N. 83° 06' E.) was operated for many years as a village co-operative, and was reopened for a brief period about 20 years ago by the National Mining and Trading Company of Bombay. Detailed mine maps and photographs made by Sanford and

Malla indicate that the richest portions of the thin cobaltiferous quartz veins occur at the junction of sheeted zones and a certain dolomite bed. Since the old workings stop at water table, and since the ancients did not explore the concealed areas, chances of finding additional ore seem good.

The Khokling mine (N. 27° 24', E. 87° 39') near Taplejung in eastern Nepal was examined in 1953 and again in 1958 because of its reputation as a former producer. The workings are comparatively large, but many of them are inaccessible. Apparently the ore bodies were linear shoots associated with thin cupriferous quartz veins that follow shear zones in schist and gneiss. Operations ceased about 10 years ago. The nickel deposit at Nangre is said to carry about one-half percent cobalt.

COPPER—The centers of production of the old copper industry were Nangre (N. 27° 37', E. 85° 51'), Kulikhani (N. 27° 38', E. 85° 10'), and Wapsakhani (N. 27° 31', E. 86° 34'). Most of the deposits are lenticular quartz veins carrying chalcopryrite, pyrite, and secondary minerals, assaying 5 to 25 percent Cu. The mines at Nangre were in operation until about 10 years ago, with smelting, refining, and minting done locally. Nearly all the old workings are inaccessible, having slumped in landslides. The veins are said to be 100 to 250 meters long and 0.3 to 1.5 meters thick, their size apparently having been inferred from the distribution of the workings, since no ore was seen. The G.S.I. now plans to map the area to see if the highly altered phyllite in the slumped area may possibly constitute a low-grade disseminated deposit. The Kulikhani district, comprising mines at Marcu, Simle, Baseri, Kakhani, and Arkale, has been studied by the G.S.I.

for the last two years. At Arkale a promising copper prospect has been announced. No details available.

The Wapsakhani district, which includes numerous mines in east-central Nepal (Jantrakhani, Sikpasor, Syankhu, Lodim, Bulung, Khare, etc.) has been examined by the Nepal Bureau of Mines with results said to be encouraging. It now plans to map the district. A chain of large copper-cobalt quartz veins was rediscovered recently at Buddha Khola (N. 27° 49', E. 84° 27'). It has been followed for five kilometers and probably extends farther. The veins reach a maximum size of 10 by 150 meters and the largest stope measures 8 by 10 by 25 meters, but the ancients have mined out all the visible high-grade pockets, and the groundmass is submarginal, to judge from preliminary drilling.

GOLD—Placer gold has been reported from several places in the tarai. Detailed mapping and numerous test pits on tributaries of the Reu River, a branch of the Gandaki, show the immediate source of the gold to be certain elevated gravel bars. The original source is not known, but placer gold, and reputedly platinum, are said to have been worked at several places along the Gandaki in the mountains, and some prospectors believe that the gold comes from small veins in the Mustang region, near Tibet. None of the placers has ever been worked on a large scale, but none has ever been explored at bedrock because the gravels are thick.

IRON—A chain of high grade iron deposits in banded iron-formation has been followed, by tracing float, for 100 kilometers in the outer Himalaya. The most promising prospect, at Labdi Khola (N. 27° 50', E. 84° 28'), contains several million tons of 45 to 65 percent Fe, as indicated by pre-



GEOLOGICAL SURVEY party on trail in lower Himalayan mountains. Geologist D. N. Rimal, ex-University of New Mexico, is leader. Note the rice-terraced hillsides.



PANNING PLACER gold in the Tarai River. The flat hardwood board is skillfully used to make a quick but sensitive test for colors. Accurate drilling and sampling is scheduled.

liminary mapping and development work. This deposit is very well situated on the route of a proposed highway only 19 kilometers from large potential charcoal supplies in the Rapti Valley, which will eventually be a large settlement, now that USOM has cleared it of malaria and opened it with a road. The deposit at Phulchoki (N. $27^{\circ} 35'$, E. $85^{\circ} 23'$) contains about 10,000,000 tons of sedimentary hematite averaging 56 percent Fe, according to the Nepal Bureau of Mines, which has trenched it, drilled it, mapped it in detail, and connected it to the Kathmandu Valley by road.

LEAD-ZINC—The Gijang Chore Danda mine (N. $27^{\circ} 55'$, E. $84^{\circ} 27'$) near Bandipur is the largest lead mine noted so far, but most of its workings are inaccessible. Several stopes were examined, but not a trace of ore could be found. The deposit is a vein of granulated quartz about 10 meters thick which is exposed for about 75 meters. Deposits on Mount Phulchoki, near Kathmandu, are represented by a zone of disseminated sulphides about 15 meters thick exposed along a strong vertical fault for about 50 meters. The grade is difficult to estimate because sulphides have replaced the dolomite irregularly, but it is probably several percent combined Pb-Zn. The ore minerals include galena, two varieties of sphalerite, and traces of chalcopyrite.

MICA—Pegmatite dikes have been mined for mica at many places. The largest deposit yet investigated is one at Chaukibhang (N. $27^{\circ} 46'$, E. $85^{\circ} 26'$) northwest of Kathmandu, which is said to be about 15 meters thick and to be exposed for 50 meters. It yielded about 130 kilograms of mica, mostly No. 5, when it was worked by the Nepal Mica Company about a decade ago. Several new mica mines

have been opened at Bajhang, near Silgarhi-Doti, by the Rajah of Ramjang, who says that they are large.

OTHER—Recent discoveries include two high-quality other deposits formed by weathering of sideritic portions of dolomite formations. The Kharidhunga prospect (N. $27^{\circ} 42'$, E. $85^{\circ} 57'$) about 60 kilometers by trail northeast of the capital, has been mapped in detail and explored with many deep test pits, through which about 100,000 tons of other have been blocked out. This material is mustard yellow when fresh or carmine when roasted, has a very low specific gravity, and is relatively free of clay or other impurities. It was valued at \$40.00 per ton in Calcutta.

PETROLEUM—Burning gas seeps have been worshipped for centuries at Mukti Nath, near the Tibet border in north-central Nepal; at Dailekh, in the southwestern foothills; and in the Deokhori district of the tarai. The first area is said to be a Tertiary basin perched among the high peaks. The other two are part of the belt of Tertiary gas and oil occurrences that stretch from Burma through Assam to the Panjab. Favorable structural and stratigraphic elements can be seen in the tarai and intensive mapping by the G.S.I. in the Dailekh area likewise gives reason for hope.

TALC—Two deposits of high-grade talc have recently been brought to light, and one is already in production. The Palung mine, where 300 men are employed by the Nepal Mines and Minerals Company, is located about 70 kilometers by road south of Kathmandu. The talc is cut into bricks and sold in Calcutta as basic furnace lining. The Kharidhunga prospect, mentioned previously for its other deposits, has been explored with numerous test pits and

mapped in detail by USOM. The proved and probable reserves blocked out so far amount to 17,500 tons, of which about 5,000 tons is pure, massive talc valued at \$100.00 per ton in Calcutta. The ore bodies are lenticular veins up to 3 meters thick and 75 long, concordant with the bedding of a thick dolomite unit. Most of them can be mined by open pit.

Conclusions. Intensive exploration has brought to light several promising mineral deposits in the Nepal Himalayas. Deposits of exportable non-metallics that can be mined under present conditions with relatively little capital investment include: high-quality talc, high-grade other, slate, and mica. Mapping and drilling the known cobalt deposits would probably result in finding more ore, and purposive exploration might also revive the copper industry. Gold, nickel, and lead-zinc remain problematical. Large deposits of barite and garnet sand have been reported, but require further investigation.

Lack of transportation is the big problem, but where it has been solved, renewed interest in prospecting has followed. Large areas of the country have yet to be examined by a mining man, and most of the old districts will have to be mapped in detail before they can be appraised from the standpoint of modern industry, but if the rate of discovery of recent years can be maintained, the outlook for a modest mineral production is bright.

Special thanks. To B. E. Ashley, of the Foreign Activities Division of the U. S. Bureau of Mines, and to G. R. Richardson, present Minerals Advisor to the government of Nepal, for reading the manuscript and for providing much information. The maps were compiled and drafted by B. R. Singh and D. N. Suwal of USOM Nepal.

END

Why Canada and the United States MUST mine more gold and silver

by George O. Argall, Jr.

Editor

The first 100 years of gold mining in Canada was the theme of the annual convention of the Prospectors and Developers Association at the Royal York Hotel in Toronto early in March.

V. C. Wansbrough, managing director, Canadian Metal Mining Association, outlined this century of gold mining and its importance to the development of Canada. "The Role of the Royal Canadian Mint" was outlined by N. A. Parker, Master of the Mint at Ottawa. The Bank of Nova Scotia has played a most important part in supplying the Free Markets of the world with Canadian gold. J. F. Foreman, Bank supervisor, gave a detailed report on "Free Gold Markets of the World."

George O. Argall, Jr., Editor of MINING WORLD and WORLD MINING, reported on the need to mine more gold and silver because we need more of both metals. There is a great shortage of these metals in the Free World compared with its needs. The need for gold grows more urgent, too, but in a rather new role—politically—in the face of the new Russian heavy ruble.

Here are some of the reasons why we need to mine and produce more gold and silver:

1. To meet growing consumption. On a worldwide scale silver production is not rising: in fact output for both 1959 and 1960 was below the average annual rate for the last 10 years. Gold output in the United States is drastically down and Canada's trend, while up last year, now looks down from the post-world-war II peak.

2. To strengthen currencies—yes, even to maintain their integrities.

3. To maintain the dollar as the paramount world currency—not let it be supplanted by the Russian ruble.

4. To restore confidence in the gold dollar as the standard unit of value.

5. To provide employment in both countries.

6. To maintain a skilled reserve of exploration and mining manpower.

7. To form an industrial basis for development of tax supporting communities in the remote and undeveloped areas of both countries.

8. To make it attractive to train and keep large geological staffs in the field so that we may keep abreast of the expanding Russian-Red Chinese geological know-how.

9. To profit from discoveries of other mineral deposits while seeking gold and silver.

The following ideas and suggestions were presented on how more gold and silver can be mined in the two countries.

There is no substitute for profit—and that's how more gold and silver can be mined. Government at all levels is by far the most important factor in gold and silver. The United States Treasury sales of general fund silver clamped a price ceiling on silver. The gold situation is much the same now with the "bright New Frontier" look—but unfortunately the look is paper green, and not a golden glow.

Here are some ideas on what can be done to increase mining.

Gold and silver should immediately be added to the list of minerals eligible for maximum Office of Minerals Exploration loan assistance. This would mean that the federal government could advance 75 percent of the funds for exploration, repayable as a royalty out of ore and metal sales. Federal engineers, of course, have always checked all applications to determine those properties with the best geologic indication for a successful exploration program.

By the relatively simple process of raising the 15 percent depletion rate on gold to 100 percent, gold exploration and mining would immediately become attractive—yes, highly desirable to a number of United States companies and individuals. In effect, this is true in Canada for three years, for new mines. This method would have the advantage, too, of continuing the limitation on profits of those few present producers to 50 percent of their net, so that Congress couldn't be accused of making giveaways to relatively few producers in the New Frontier with its increased attacks on depletion.

Such a procedure to stimulate gold

production, of course, would have the advantage of being politically and legislatively feasible in comparison with many bills already introduced in the 87th Congress.

Recent requests, letters, and powerful nudges from the new President have been directed toward state and local governments to do something to reduce unemployment. In view of this, there is little question that if the federal government would give tax consideration or other positive steps to make gold and silver mining popular again, the other government bodies would adopt similar incentives.

Government departments in Canada have maintained regular and continuing studies on gold and silver geology, mining, and recovery methods. In the United States there has been an almost total stoppage of all such work. This trend must be reversed by the accelerated mapping and genesis study of old districts, the search for unknown deposits, and the publication of new geological reports.

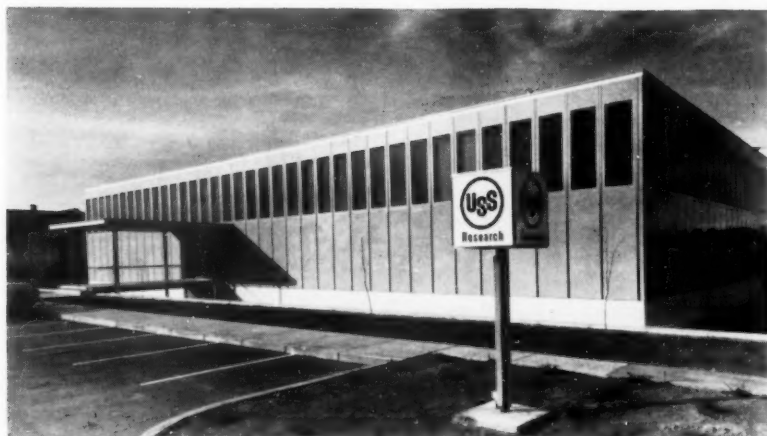
Sadly, yet truthfully, the young geologists and prospectors must be re-educated on gold and silver occurrences. The work pioneered in Africa and Europe indicating low cost, fast, highly selective, and ultra-high-recovery techniques using solvent extraction and ion exchange for gold must be extended to United States laboratories. Many metallurgical break-throughs in developing these methods were achieved in government-supported uranium laboratories, so a nucleus of trained personnel could immediately turn to an all-out program on gold and silver.

Another metallurgical achievement looks as if it will be here ahead of solvent extraction and ion exchange. This is cyaniding in an acid circuit, which will open the door to treatment of complex and refractory ores.

The technical mining press can help to re-educate the industry and the public, too. MINING WORLD started this by publishing an excellent article in its January 1961 issue: "How about gold? Where mined and future production outlook." This was written by United States Geological Survey personnel and is a good example of the fine work of the Survey's geologists.

END

WHAT'S GOING ON in mining



Columbia-Geneva Opens Research Center in Utah

The growing importance of western steel in the national economy is emphasized by the establishment of this Raw Materials Research Laboratory opened March 8 by Columbia-Geneva Division of United States Steel Corporation. One of the most advanced research centers in the American steel industry, the unit adjacent to U. S. Steel's Geneva Works at Provo, Utah, is devoted exclusively to the study of raw materials for steel-making. Intensive studies on western iron ores, limestone, manganese, fluorspar, and other materials have already begun at the center. Some 30 scientists and other staff members are seeking better and more effective ways for producing high quality steels more economically, and for conserving western steelmaking materials by putting them to the most complete efficient use. Immediate objectives include studies on concentration and agglomeration, and the evaluation of western raw materials deposits.

Colorado

The Ceresco Ridge exploration adit being driven at the Climax, Colorado, property of Climax Molybdenum Company will be 1,200 feet long when completed. It will then be concreted back from the underground heading toward the portal. Anticipated completion date for the project, under contract to Boyles Brothers Drilling Company of Salt Lake City, Utah, is mid-June. The work began late in January and in mid-February it was being driven in glacial till and various clays. If the intense exploration of the Ceresco Ridge area indicates production will be practical, output of 5,000 tons of molybdenum per day is expected by 1965.

Vanadium Corporation of America will install a concentrator on the company's former mill site near Naturita, Colorado. The concentrator will use a new process developed by the company at its research laboratories to extract uranium or vanadium from ore. Capacity of the concentrator, which will include the most modern ore receiving and sampling plant facilities, will be 400 tons per day. Soil at the site of the new installation has absorbed enough uranium through leaching and spillage during the years, to run almost as high as the ore in any mine in the area.

In developing its newly discovered ore off the American Tunnel in its Silverton, Colorado, operations, Standard Metals Corporation has scheduled up to 1,000 feet of work in drifting and cross-cutting. The firm has completed its intersections of mineralized areas through American Tunnel extensions, and both Washington veins

have been cut, as well as the Belle Creole vein, and drifting on both has started. The latter vein, although 600 to 1,000 feet lower than any previous workings, is expected to prove of great importance since it is well mineralized over its full width, which is about 10 feet at the American Tunnel level and six feet at the upper levels. Values run up to \$26 a ton over a considerable length of the Belle Creole. In the footwall of the Washington vein values of \$25 a ton have been assayed over a 24-foot width, and in the hanging wall assays run nearly \$25 a ton over a width of 18 feet. Grade of ore at the point of intersection between the Washington vein and the American tunnel is higher than expected, and an even higher grade of ore is anticipated along the vein to the east. About 500,000 tons of proved ore will be available for mining through the American Tunnel when the raise to be started soon will effect a break-through to I level about 300 feet above the tunnel. The water level in the bottom of the old Washington shaft is being drained at the rate of about three and a half feet daily and faster as old stopes are drained out. The Silverton mill has been completely reconditioned so it can handle new ore as it is mined.

U. S. Beryllium Corporation has purchased the BER claims on Badger Flats in Park County, Colorado, formerly held by Denver-Golden Corporation. The 14 claims extend U. S. Beryllium holdings around the Boomer mine, which the corporation operates under a half-leased, half-owned basis, and give the firm ownership or control of approximately two square miles of claims in the promising Badger Flats beryllium area. Ores from the Boomer and Redskin mines have been upgraded to as high as 33 percent beryllium oxide content by Mineral Concen-

trates and Chemical Company, which is now erecting a 50-per-ton-per-day upgrading mill on Badger Flats to treat these ores. (See MINING WORLD, March 1960, page 28)

Utah

A pilot plant program conducted by Minerals Engineering Company and Susquehanna Corporation at the old Garfield Utah cobalt refinery of Calera Mining Company is testing removal of vanadium from the slag concentrate of electric furnaces used in producing elemental phosphorous by Food Machinery and Chemical Corporation at Pocatello, Idaho.

Col-U-Mex Uranium Corporation hopes to mine out its properties in the Big Indian District of Utah within a year and reinvest the proceeds in other ventures. The Col-U-Mex claims are operated by Standard Metals Corporation of Moab in conjunction with that firm's adjacent Big Buck mine.

Surface plant construction at the \$30,-000,000 potash project of Texas Gulf Sulphur Company south of Moab, Utah, was begun recently by Stearns-Roger Manufacturing Company, which is also constructing the collar for the 2,810-foot shaft. The Denver firm will take the 22-foot diameter shaft to about 100 feet, install the collar, and construct a reinforced concrete head frame. Contractor for sinking of the shaft has not yet been announced but this phase of the project is expected to begin in May or early June.

Since the start of the uranium boom, some 309,380 uranium claims have been located in the state of Utah, with more than 100,000 of these in San Juan County. According to a recent report of the uranium committee of the Utah Mining Association, it has cost prospectors some \$14,695,550 just to locate these claims, plus \$17,316,721 for drilling. Required assessment work on these properties will cost \$68,150,700 between July, 1946 and December 31, 1966. In the report which was designed to show the contributions of the uranium industry to the state of Utah and also to demonstrate costs involved in producing salable uranium concentrates, the committee figures that by the start of last year some 5,815,600 tons of uranium ore had been mined in Utah, and that another 5,300,000 tons would be mined in the period through 1966. Total cost of mining this 11,115,600 tons as figured by the committee is \$478,365,751 through 1966.

The 15 percent overall increase in value of metal production for the state of Utah during 1960 resulted primarily from a \$51,600,000 advance in the value of copper output, which accounted for one-third of the total value of all minerals. While gold, silver, and molybdenum output recovered mainly as byproducts of copper production, increased over 1959, as did output of iron ore, lead and zinc production remained about the same as the previous year. The value of uranium ore decreased significantly, but that of vanadium, a byproduct of uranium treatment, increased.

New Kennecott Plant Supplies Lime for Concentrator at Ray

Ray Mines Division of Kennecott Copper Corporation has started operation of its new plant that will supply smelting flux and feed to the new lime-burning and slaking facility at the Ray concentrator.

Engineered by Kennecott Copper Corporation and built by Western-Knapp Engineering Company of San Francisco, the plant at Hayden, Arizona, is producing 50 to 60 tons of burned lime a day with three of its five kilns in operation. Potential capacity, with all kilns in use, will be about 100 tons per day. In conjunction with the lime slaker constructed earlier by Stearns-Roger Manufacturing Company of Denver, Colorado, the new plant will provide all the lime needed for the division's operations.

The new plant is part of the division's continuing program. Construction on the plant was begun last June.

ASARCO Modernizes Smelter To Prepare for Mission Output

The American Smelting and Refining Company is modernizing its Hayden Smelter at Hayden, Arizona, preparing for the time that copper production from the Mission Project mine becomes available. Target date for production from Asarco's Mission mine is the spring of

1962. The Fisher Contracting Company of Phoenix, Arizona, has the contract for the modernization program on which work began a few weeks ago. (See *MINING WORLD*, August 1960, page 26)

Some new equipment for dust collecting is being installed at the smelter, and the capacity of the power plant is being increased. In addition, the smelting furnace is being rehabilitated and modernized, and some of the wornout equipment will be replaced. No appreciable expansion of smelting capacity is planned at this time.

Asarco's Hayden plant started production in 1912. Changes made during the ensuing 50 years are said to have given the plant an annual capacity of about 300,000 tons of ore and concentrates. For many years the Hayden smelter handled the production from the Ray Mines Division of Kennecott Copper Corporation under a long-standing smelting agreement. That agreement ended August 31, 1958, when Kennecott's own smelter at Hayden went on a full production basis. Since then, Asarco's plant has operated on a straight custom basis and on production from its own Arizona mines.

Arizona

Two new furnaces and coolers will be installed and plant capacity increased to 750 tons per day at the **Lake Shore** copper mill of **Transarizona Resources, Inc.**, south of Casa Grande, Arizona. The

original large-scale pilot plant which uses the much-discussed segregation process, is reported to have performed satisfactorily. Mining has been suspended until the new equipment is obtained and installed, to raise the plant capacity from its original 250 tons. The completed plant should be in operation within another six months. Reserves of the deposit, which will be mined by open-pit methods, have been estimated at some 2,000,000 tons grading about 1.8 percent copper. The structure is still open to depth and on strike. The company property also includes 12 other anomalous area which will be tested. These magnetometer anomalies are thought to contain magnetite, with which the copper values in the present deposit are associated. **Transarizona Resources Ltd.** of Canada and associated companies have a controlling interest in the Arizona firm. George Freeman of Casa Grande is manager of the company.

Inspiration Consolidated Copper Company, Inspiration, Arizona, has announced a 10 per cent cut in production. According to H. Carroll Weed, vice-president and general manager, the cut-back will be accomplished by closing down the plant one week out of every 10 weeks rather than by personnel layoffs. Many employees, he said, are expected to use vacation time for the actual shutdowns, thereby avoiding all but a minimum of lost time. The first shut-down period was scheduled for February 13, with regular operations resuming February 20. Development work at the company's Christmas division was not affected by the shut-down order.

The Verde Gypsum Company is shipping about 2,500 tons a month of gypsum from the Larson deposit east of Camp Verde, Arizona. The production goes to the **Phoenix Cement Company** at Clarkdale, the concern which holds the cement contract for Glen Canyon Dam. A new crushing and screening plant was installed recently, making possible more accurate sizing of material. A crew of seven or eight men is employed regularly at the gypsum operation. Gordon R. French is president of the company.

At the annual meeting of shareholders of the **Arizona Mohave Mining Company**, Earl Duke, president, Kingman, Arizona, reported plans to continue exploratory activity during the ensuing year. A considerable tonnage of ore which would justify concentration has been developed, he said, and the management feels that ore showings fully justify further exploration. The company's property includes the **Mexican** mine, located in the Cerbat Range of the Wallapai mining district.

The **Gold Belt** mill, near Mayer, Arizona, has been taken over by the **Louis Development Company**, of Phoenix. Four men are employed rehabilitating the mill. The new operators propose to develop the **Surprise** group of claims, adjoining the **DeSoto** on the west, and to handle dump and custom ores.

A small program of diamond drilling is underway at the **Charlotte** group of claims in the Pike's Peak district of Maricopa County, Arizona. Two holes to a depth of 125 and 100 feet, respectively, have been drilled and a third is in progress. In addition, cross-trenching of the vein is planned. Gerald Weathers, of Phoenix, is directing the program and the property is owned by C. W. Triphahn, of Phoenix.



Johns-Manville Mines and Mills New Mexico Perlite

At the new Johns-Manville Corporation's perlite mill at No Agua, New Mexico, a bulldozer pushes ore from the stockpile into a 25-by-40-inch primary crusher as shown above. After initial reduction in size, ore goes by conveyor, bucket elevators, and chutes through subsequent milling processes that include large rotary dryers to reduce surface moisture to less than half of one percent. The \$1,000,000 mill, opened in December, has an annual capacity of 150,000 tons, contains 30,000 square feet of working space and includes nine silos for storing 2,150 tons of processed perlite. The perlite ore is mined from a deposit covering over 2,000 acres adjacent to the mill site. The Johns-Manville property is located in a high valley west of the Rio Grande River where ore reserves several hundred feet deep are expected to last over 100 years. In the open pit, overburden five to nine feet thick is removed before the exposed ore is broken out in sizes from two-foot boulders to sand-fine grains. Milled perlite is trucked from No Agua across the New Mexico border to Antonito, Colorado, 24 miles north, where a Johns-Manville blending and loading plant prepares it for shipment.

Nevada

A contract for extensive underground work at the **Mt. Wheeler** beryllium properties of **The Anaconda Company** south-east of Ely, Nevada, has been awarded to **Centennial Development Company** of Eureka, Utah. Centennial will drive drifts and crosscuts off the Pole Canyon adit, which is over 8,000 feet long, and off the 300-foot North Adit in development of beryllium ore shoots. The Pole Canyon will be rehabilitated for about 4,500 feet. Steele McIntyre will be in charge of the Mt. Wheeler project on which some 20 miners will be employed eventually. Anaconda has a two-year option from **Mt. Wheeler Mines, Inc.**, for the property covering some 2,000 acres. (See **MINING WORLD**, January, 1961, page 45)

The drilling program of **Ruby Hill Mining Company** in Eureka County, Nevada, is continuing, but no results have yet been disclosed. Ruby Hill was organized last summer to operate the **Richmond-Eureka** lead-zinc-gold property for **Newmont Mining Corporation**, **Cyprus Mines Corporation**, **Richmond-Eureka Mining Company**, **Eureka Corporation Ltd.**, and **Hecla Mining Company**. (See **MINING WORLD**, May 1960, page 29)

Disclosure of what may be an entirely new deposit of gold ore has been made by a development program conducted by **American Exploration and Mining Company** on the property of **Goldfield Consolidated Mines Company** in Goldfield, Esmeralda County, Nevada. Sinking of a new shaft has been started about 200 feet from the Hayes Monette shaft which was sunk on the Hayes-Monette lease block in the early days of Goldfield when several million dollars worth of ore was produced. Hatfield Goudey is chief geologist for American Exploration and Mining Company, a San Francisco-based firm that also has an interest in the old Holt Silver mine near Enterprise, Utah (See **MINING WORLD**, March 1961, page 51). Drilling is being done by Gerry Kennedy of Tonopah, Nevada, under direction of William Clark, San Francisco geologist.

The Atomic Energy Commission has awarded **Kerr-McGee Oil Industries, Inc.** of Oklahoma City, Oklahoma, a contract for drilling a 1,500-foot vertical shaft in the Yucca Lake area of the Nevada test site as part of the nation's seismic research program. Cost of the work will be over \$500,000, and the shaft is to be completed by mid-May. The 44-inch diameter shaft will be drilled in granite and **Kerr-McGee** is using its No. 7 drill rig with which the company recently drilled the 90-inch ventilation shaft at **Kermac Nuclear Fuel Corporation's** Ambrosia Lake uranium mine in New Mexico. (See **MINING WORLD**, March 1961, page 34)

New Mexico

Production at the new ore body of **Duval Sulphur & Potash Company** which is located 13 miles from the company's present Carlsbad, New Mexico, plant site is expected to begin the second quarter of this year. Ore from this mine will go by rail to the plant to be blended with ore from the mine now in operation. No

substantial increase in milling capacity is planned and production of ore from the present mine will be decreased as the new mine produces more ore, until production from the two is in balance. Duval last year adopted a new mining system which permits a higher percentage of ore recovery and which uses ammonium nitrate as a blasting agent in the mine.

Recent exploration work by **Molybdenum Corporation of America** at its Questa, New Mexico, property has been confined to two areas of indicated higher grade than the deposit as a whole (0.25 percent MoS_2 per ton). In the northeast area, work has disclosed a vertical section 400 feet long to a depth of 360 feet averaging 0.61 percent molybdenum disulphide. The company will drill to deter-

mine the lateral extent of this zone. Exploration in the southwest area has consisted of three parallel tunnels 700 feet apart, and core drilling. Average of drift and drill hole samples from three vertical sections are 0.459 percent, 0.343 percent, and 0.341 percent MoS_2 , respectively. Drifting and drilling has begun to determine lateral extent of these zones. The company expects that the intensive exploration will continue for at least another six months. Decisions about construction of a mill and its size, will not be made until exploration results are determined, but if the outcome is favorable, the company will proceed with installation of mining and milling facilities. The mineralization is of a familiar type so no special problems are visualized. (See **MINING WORLD** January, 1961, page 19).



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Oliver Plans Washing Plant To Improve Ore at Pioneer Mine

A new washing plant to be built at Ely, Minnesota, by Oliver Iron Mining Division of United States Steel Corporation is designed to improve the marketability of iron ore from the Pioneer mine, one of the first underground mines opened in Minnesota. Scheduled for completion this year, the new plant will consist of a crusher, screens, classifier, and spirals. It will be built within the existing headframe at the Vermillion Range mine and will be the first year-around operation of its kind in northern Minnesota.

According to C. F. Beukema, president of the division, the new plant will give the Pioneer ore a better competitive position on the market. Without the new facility, he said, 75 percent of the mine's production would be restricted as to saleability because of the performance of the fine materials.

The decision to build the plant was credited in part to an improved economic climate for the Pioneer mine effected by relief from the stockpile tax as enacted by the Minnesota State Legislature in 1959, as well as application of labor credits to the royalty tax and cooperation of fee owners in adjusting royalties.

The Pioneer mine shipped its first ore in 1889 and has operated continuously since then, except for the depression years in the early 1930's.

Lead, Zinc Groups Plan Annual Meetings In Chicago May 1-3

The American Zinc Institute and the Lead Industries Association will have their annual meetings this year at the Drake Hotel in Chicago, Illinois, the first three days of May. The zinc group, meeting for its 43rd yearly session, will open May 1 in a joint session with the Galvanizers Committee of the steel industry. During the afternoon the members will study zinc industry matters.

A joint session of the Zinc Institute and the lead group May 2 will be the opening session for the latter association, which continues its 33rd annual meeting May 3. Theme for the men of the lead industry this year will be "Lead's New Frontiers." Latest technological developments, the association's research program, and reviews

of the more important established lead products will highlight the program.

The joint lead-zinc session will include papers of interest to both groups on national and international developments and the general economic outlook.

Central

Bestwall Gypsum Company has started production at its new multi-million dollar plant near Blue Rapids, Kansas, which uses gypsum rock from the **Bestwall** mine, oldest active gypsum mine west of the Mississippi. The new plant has a capacity 40 percent greater than the previous one, which had been in operation since 1896. Facilities for manufacture of gypsum board and lath are included in the new plant, which manufactures industrial and wall plasters. **Bestwall Gypsum**, the country's third largest producer of gypsum products and building materials, encompasses seven mines and quarries, and 11 plants completed or under construction in the United States and Canada.

American Zinc, Lead and Smelting Company is reducing production of metallic zinc ten percent below production levels during the first half of 1960 because of its accumulation of heavy inventories under present economic conditions. The curtailment initially suspends operations at three mines in Tennessee and production of American Process zinc oxide and slab zinc at Hillsboro, Illinois. The company will curtail other operations to effect the overall reduction schedule. Total shipments of primary zinc and zinc products by the company in 1960 were 318,638 tons, an increase of about 1 percent over 1959. Shipments of stone, mining by-products, and quarry products last year increased 266,905 tons over 1959, to total 2,425,727 tons. Capital expenditures by American Zinc last year for mineral lands, plants and equipping for new mines totalled \$2,662,608.

The electronic metals and compounds plant of **Eagle-Picher Company** will be relocated on a site about 10 miles east of Miami, Oklahoma, where construction on a new 20,000-square-foot building has started. Present location of the plant, which recovers germanium, gallium and other rare metals and their salts from zinc smelter residue, is in the city of Miami. It will be used temporarily by technical and engineering personnel of

the firm. The new plant, which is to be completed this summer, is located near the center of a 600-acre tract owned by Eagle-Picher for some time.

The planned expansion of its **Herculeum**, Missouri, lead smelter from 110,000 to 150,000 tons per year will be postponed by **St. Joseph Lead Company**, along with a 15 percent curtailment of output at its New York zinc mines and at its Josephstown, Pennsylvania smelter. The southeast Missouri mines of the company will not be affected by the curtailment. During 1960 **St. Joseph** produced 147,879 short tons of lead concentrate at its mines, and purchased 13,656 short tons of concentrate, compared with 143,167 produced and 8,300 purchased in 1959. Tonnage of zinc concentrate produced last year was 128,762, and purchased amount was 134,773 tons. Comparable figures for zinc in 1959 were 81,292, and 104,493.

Schroeder Mining Company may have to suspend operations at its heavy media processing plant in Koskonong, Missouri, if excessive freight rates of the Frisco Railway are not modified. **Schroeder's** plant was moved to Koskonong last summer to process ore from its own operations and those of **Miller-Reynolds** and **Midwest Mining** companies and other small mines in the area. Present rate for the Missouri ore (about 50 percent Fe) is \$3.40 per ton while similar shipments from **Schroeder's** Chatfield, Minnesota, mines (about 56 percent Fe) are \$3.28 per ton.

Eastern

American Potash & Chemical Corporation has begun construction on a \$5,000,000 manganese metal plant adjacent to its sodium chlorate plant at Aberdeen, Mississippi. **Stearns-Roger Manufacturing Company of Denver, Colorado**, is contractor for the plant which is to be completed next November. It will be American Potash's first commercial manganese metal operation, although the firm has produced the material on a pilot plant scale.

During the last six months the tantalum production capacity of **National Research Corporation's Metals Division** has increased by 33 percent to meet the rising demands for the high temperature metal in electronic and missile space

Sinter Is Cooled By Blasts of Air In J & L's New Stationary Cooler

Blasts of air cool the sinter as it works down through a vertical shaft in this new type of cooler put in operation recently at the New York Ore Division of **Jones & Laughlin Steel Corporation**. First of its type, this equipment differs from the usual rotating cooler in that it is stationary. Sinter is cooled for as long as 1½ hours compared to 15 to 20 minutes in a circular cooler, and then can be loaded directly in railroad cars. Shaped much like a blast furnace, the new cooler has a rated capacity of 3,800 gross tons per day. It was designed and installed by **Dravo Corporation** of Neville Island, Pennsylvania. In the operation, fused sinter leaves two six-foot wide sinter machines and is discharged onto an apron feeder which carries it to a **Dravo-Lurgi** breaker. After passing through a **Dravo-Schenck** vibrating screen the sinter goes by pan conveyor to the cooler. At the discharge end of the cooler, a combination fender-screen removes the cold fines and delivers cooled sinter to railroad cars.



products. The division is a major supplier of capacitor grade tantalum powder for electronics and also produces a high temperature alloy of 90 percent tantalum and 10 percent tungsten for rocket engine and missile use.

A 15 percent reduction in output has been put into effect at the Palmerton, Pennsylvania, zinc smelter of **New Jersey Zinc Company**. The tonnage involved is some 1,650 tons of zinc per month. Operations at the Depue, Illinois, operation of the company were unaffected by the curtailment.

North Carolina's metal production increased substantially during 1960, with a 26 percent quantity and a 33 percent value rise for copper; an output of tungsten more than double that of 1959, a sharp increase in gold and silver, as well as a substantial output of lead. Value of the year's mineral production was \$43,200,000, up 4 percent from the previous high of 1954.

Iron Ranges

During the 1960 season **Cleveland Cliffs Iron Company** shipped a total of 6,227,488 tons of iron ore from the Lake Superior region, compared with only 4,384,966 tons shipped by the company in 1959. Of the 1960 tonnage shipped, 3,852,182 tons came from the Marquette Range in Upper Michigan and 2,375,306 tons from the Mesabi Range in Minnesota.

Northern Natural Gas Company of Omaha, Nebraska has requested permission to sell natural gas to the **Reserve Mining Company** at Silver Bay, Minnesota, for use as fuel in processing Reserve's taconite iron ores. Only opposition to Northern's request came from an attorney representing various coal producers, many of whom market their coal in the Minnesota iron mining areas. If approved, Northern would have to construct a 63-mile branch line from Duluth to Silver Bay as well as increase its main line compression facilities. The estimated cost of these ventures is \$6,000,000. The gas firm plans to sell 12,000,000 cubic feet of gas daily to Reserve for use in its pelletizing plant and to make another 14,000,000 cubic feet daily available for power plant requirements. Reserve Mining Company, in testimony given before the power commission, stated that use of natural gas would produce better burning conditions in the pelletizing furnaces as well as save a considerable amount of money. Cost of converting the pelletizing furnaces to a natural gas system will be \$450,000. If Northern's application is approved it would be the first large-scale use of natural gas for taconite processing.

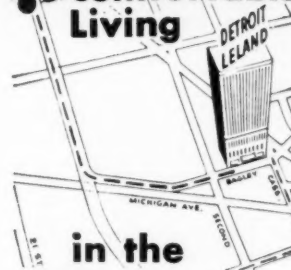
Total production of iron ore pellets for **Reserve Mining Company** during 1960 was 5,446,342 tons, with shipments totaling 4,941,322 tons. Royalties of \$1.00 per ton were paid on 4,412,668 tons to **Mesabi Iron Company** under an agreement reached last year after litigation between Mesabi and Reserve's two shareholders, **Republic Steel Corporation** and **Armco Steel Corporation**. The stockpile at the end of 1960 contained approximately 1,000,000 tons of pellets on which royalty will be payable to Mesabi when shipped in 1961. Reserve's \$120,000,000 expansion program to increase production to 9,000,000 tons of pellets per year was accelerated during the shutdown last fall when repairs and replacements in

equipment were made at the Silver Bay, Minnesota plant. Rock excavations on the railroad from the D.M. & I.R. junction at Norshor have been completed, so there will be no interference with production schedules when major equipment items arrive for installation in the expanded plant.

The construction schedule for the addition of crushing, grinding, and flotation facilities at the Republic, Michigan, operation of **Marquette Mining Company** calls for pouring of foundations and erection of steel structures to start the second week in April, weather permitting. Ground breaking was to start the first week of March. **M. W. Kellogg Company** of New York has the prime contract for the plant, while **Arthur G. McKee Company** will build the new pelletizing plant near by. The expansion will increase capacity at Republic from 700,000 tons of iron ore pellets to 1,600,000 tons per year.


Production cutbacks at Gogebic Range iron mines operated by **Pickands Mather and Company** in Michigan will reduce operations at three mines and completely suspend those at the **Newport** mine in Ironwood and the **Sunday Lake** in Wakefield. The curtailment calls for operating two shifts a day, four days a week, at the **Peterson** mine at Bessemer and the **Geneva** and **Cary** mines at Hurley, Michigan. Increased taxes and a poor market for the Gogebic Range ore, which averages only 53 percent Fe, make the future outlook for the area unpromising, according to **Everett Joppa** of Duluth, Minnesota, general manager for **Pickands Mather** in the Lake Superior district. The P-M mines have employed about 1,400 miners on the present schedule since 1959. At one time the work force totalled more than 8,000.

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AIME and ASM Sponsor Spokane Conference April 13, 14, 15

Feature of the Pacific Northwest Metals and Minerals Conference being held in Spokane, Washington, April 13 through 15 will be 11 technical sessions. The conference at the Davenport Hotel is sponsored jointly by the Columbia Section, AIME, and the Spokane Section of the American Society for Metals.

In the AIME program there will be two sessions each on mining and geology, and one each on industrial minerals, minerals beneficiation, and geophysics. The ASM program comprises two sessions each on primary metal working and secondary metal working. Field trips are scheduled for the closing day of the conference, Saturday, April 15.

Conference chairman is W. D. Nesbeitt.

Alaska

Little Squaw Mining Company has completed 655 feet of drifting, raising, and crosscutting at its **Mikado** mine in the Chandalar district of Alaska. The development work has blocked out, in a 100- by 135-foot zone, \$1,013,000 worth of \$89.00 per ton gold ore, mineable on an average 10-foot width. The company has purchased tractors and other equipment from Hugh Matheson and will continue underground development. Surface trenching and road building are also planned. Although the gold lodes of the Chandalar have been known for many years, this is the most ambitious project in that district so far. Little Squaw Mining Company, an Alaska corporation, is owned by Grandview Mines and Metaline Mining & Leasing Company, both of Spokane, Washington.

Total output for 1960 at the **Red Devil** mine of **De-Coursey Brewis Minerals Ltd.** in Alaska was 4,401 flasks of mercury, which was nearly 22 percent higher than the 1959 output. A record of 534 flasks (76 pounds per flask) was set in November. Exploration and development work during 1960 is expected to result in increased production for 1961 because of higher grade ore reserves.

Ten flasks of quicksilver have been recovered from the Arctic wilderness where they were abandoned about 40 years ago along with milling machinery. They were discovered last summer by Eskil Anderson, geologist for **Little Squaw Mining Company**, which is developing properties in the Chandalar gold mining district abandoned by New York interests which could not cope with transportation problems. The flasks, weighing 930 pounds, were flown out recently in a ski-equipped plane piloted by veteran bush pilot J. L. Anderson, Bettles, Alaska.

Idaho

A new 60-ton concentrator was put in operation recently at the **Empire** copper mine near Mackay, Custer County, Idaho. Some crude ore also is being shipped. Management plans to construct a larger mill at the old Cossack site near Mackay.

The **Bunker Hill Company** at Kellogg, Shoshone County, is preparing plans for a new \$5,000,000 sintering facility and a sulphuric acid plant at its lead smelter. Start of construction will depend upon

market conditions. The proposed new acid plant would have a capacity of 75,000 tons yearly. The present acid plant at the firm's electrolytic zinc plant produces about 120,000 tons a year. Employment by the **Coeur d'Alene** mining region's largest operator is expected to average about 2,200 this year.

Sunshine Mining Company, operator of the nation's biggest silver mine in Shoshone County's **Coeur d'Alene** mining district of Idaho, recently started an interesting diamond drill hole in the adjoining **Sunshine Consolidated** property. Whereas other diamond drilling in Sun Con ground has been from the deep 2700, 3100, 3400 and 3700 levels where production has been obtained from the westerly extension of **Sunshine's** **Yankee Girl** vein, the new hole is going down from creek level. The 1200-foot hole is angled to cut the vein at a depth of about 1,000 feet—in the **St. Regis** formation which was the best producing horizon for the famed **Sunshine** vein. The **Yankee Girl** vein, where opened in Sun Con ground in the lower **Revett** formation, has been narrow. Current production is minor and confined to the 3400-foot level.

Work will start soon on deepening the shaft of the **Conjecture** silver mine in the **Lakeview** mining district, **Bonner County**, Idaho. It will be extended 1000 feet to the 2000-foot level from where a drift will be run to probe the favorable **St. Regis** host rock. Former plans called for only a 400-foot extension of the shaft. The property is owned by **Conjecture Mines, Inc.** of Spokane, Washington, and operated under a profit-sharing agreement by **Federal Resources Corporation**, Salt Lake City. If grade and extent of ore continues at lower levels, Federal will control a mine that could provide a sizeable cash flow for many years, according to **Nels W. Stalheim**, chairman of the board.

Montana

The **Mystery** mine in Montana, manganese producer during the government stock piling program for manganese, has been purchased from the estate of the late **Jennie M. Moore** by **Phil Salois** of **Philipsburg**, Montana.

The **M. & H. Mining Company** of **Boulder**, Montana, has suspended operations at the **Crystal** mine northwest of **Basin**, Montana, during the winter months, but plans to resume work in the spring.

The ten percent reduction in copper production by **The Anaconda Company** at its Montana operations will be in the **Berkeley** open-pit and the **Kelley** block-caving mines. The company plans no curtailment from the producing deep-level vein mines—the **Mt. Con** and the **Steward**. **Anaconda** will proceed with its deep level development at the **Kelley**, **Mt. Con** and **Steward**. The **Anaconda** cutback, similar to those of other major copper producers, will reduce employment by about 400 at **Butte**, Montana, with smaller reductions at **Anaconda** and **Great Falls**.

Operations have been resumed at the **Jack Waite** lead-zinc mine on the **Montana-Idaho** border west of **Thompson Falls**, **Sanders County**, Montana, following settlement of a seven-month labor strike. The mine is operated on a profit-

sharing basis by **American Smelting and Refining Company**. **Philip A. Borelli** of **New York**, is president of **Jack Waite Mining Company**.

Sampling of ore shoots and trenching is planned for this season at the **Bay Chief** lead-silver prospect in the **Eddy Creek** mining district, **Sanders County**, Montana. The 15-claim property was acquired on a lease and purchase option basis recently by **Robert J. Hundhausen**, **Spokane** mining engineer; **L. L. McLean** and **G. Fansler**, also of **Spokane**, and **Clair Wynecoop** of **Wellpinit**, Washington, from **State Mining Company** of **Spokane**. The late **Fred M. Viles**, who controlled **State Mining**, built eight miles of access road to the property and exposed several ore shoots.

Oregon

The world's first casting of pure tungsten is claimed by **Oregon Metallurgical Corporation** at **Albany**. Two rocket nozzles of pure tungsten were cast and will be subjected to severe tests. **Stephen M. Shelton**, former head of the **United States Bureau of Mines'** electrometallurgical laboratory at **Albany**, is president of **Oregon Metallurgical**.

Two carloads of copper-bearing vein quartz have been shipped by **Harry Commers** of **Grants Pass**, Oregon, from the **Copper Eagle (Brass Ledge)** mine in the **Galice** district of **Josephine County**, Oregon, to **Asarco's** **Tacoma** Washington smelter.

Washington

A new vein carrying commercial gold ore has been opened in the old **Republic** gold camp, **Ferry County**, Washington. Discovered in a joint development program by **Knob Hill Mines** and **Day Mines, Inc.**, it is northwesterly of all previous underground workings. Moderate-grade ore is being mined from the structure, called the **No. 3-Jo**, via the eighth level of the **Knob Hill** mine. **Day Mines'** rich **Gold Dollar** vein, which **Knob Hill Mines** has been developing and mining for several years, has been proved by diamond drilling to continue down-dip at least 350 feet from the present lowest operating level of the **Knob Hill** mine.

Former shareholders of the dissolved **Northwest Uranium Mines, Inc.**, recently were mailed checks totaling \$378,000, representing a second distribution of funds from sale of uranium holdings in the **Spokane Indian Reservation** to **Dawn Mining Company**. The first payment, distributed last August, totaled \$405,000. In the suit brought by **Jack D. Gay**, trustee for shareholders of **Northwest Uranium** and for **Silver Buckle Mining Company** against the **Atomic Energy Commission** for \$5,000,000 the government has moved for dismissal, on grounds that the evidence produced is insufficient. The plaintiffs asserted they had a "right" to a uranium mill contract and that the government was obligated to award such a contract, while the government contended the claim of "right" to a mill contract is without basis in law. The two firms sued for the amount they say they would have made if the **AEC** had fulfilled alleged commitments to them concerning mill contracts and purchase agreements covering the **Spokane Indian Reservation** ore body, now owned by **Dawn Mining**.



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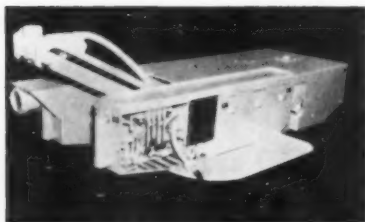
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The Diesel engine develops 62 horsepower at 3,000 rpm while the regular Jeep gasoline engine has 72 horsepower at 4,000 rpm. While the initial cost of a Jeep vehicle with a Diesel engine is higher, purchasers will have advantages of reduced running costs and lower maintenance charges. In many countries Diesel fuel is cheaper than gasoline and in some cases is more plentiful and easier to obtain. Circle No. 59.

New Submersible Motor Line

A new line of submersible a-c. motors has been introduced by Reliance Electric and Engineering Company. The new pressure-proof motors, especially designed for close-coupling to centrifugal pumps operating in any depth of water, oil or liquid chemicals, are now available in sizes from $\frac{1}{2}$ through 40 horsepower for operation from poly-phase power sources, and from $\frac{3}{4}$ through 5 horsepower for single phase connection. Circle No. 16.



New Roof Bolting Machine

One-man operation and a high degree of maneuverability feature the new model roof bolting machine developed by the Long-Airbox Company.

Designed with variable drilling speed for different types of rock and with a 42-inch lift, the new machine can drill the back and set a bolt in 65 seconds. Its 40-inch width and ability to turn in its own length of 108 inches facilitates maneuvering in narrow drifts and close timbering. Circle No. 31.



New Heavy-Duty Compressor

Availability of a new 100 horsepower, heavy-duty air compressor delivering from 509 to 565 cubic feet of air per minute at pressures ranging up to 125 psi has been announced by Atlas Copco.

A modern short stroke, two-stage, double acting, fully air-cooled compressor, the DT4 has an outstanding capacity to weight ratio, requiring 30 to 50 percent less space than other compressors of this capacity. Circle No. 15.

Magnetic Separator for Labs

The isodynamic magnetic separator, developed by the S. G. Frantz Company, has proven to be an outstanding research tool for the mineral investigator. It is used in the mineralogical research laboratories of many countries for the delicate separation of minerals throughout the entire range of magnetic susceptibilities.

For details and complete specifications on how this useful machine can be of service to you circle No. 8.

Hydraulic Fluid Resists Fire

A new product now being marketed by Gulf Oil Corporation, called Gulf FR Fluid, offers the mining industry a fire resistant hydraulic fluid that is competitive in cost with straight mineral oil.

An emulsification of 40 percent water in oil gives the new product its resistance to fire. Each droplet of water is coated with oil, providing lubrication equivalent to all-oil fluids. In the event of fire, the water droplets turn to steam and snuff it out. Circle No. 5.



Long Range Walking Dragline

Bucyrus-Erie Company, South Milwaukee, Wis., has introduced a new long range walking dragline to the mining industry—the Model 1250-W. Largest Bucyrus-Erie machine of its type, the new full electric 1250-W embodies major new design features which enable it to handle larger capacities at greater boom lengths. The unique boom design, apparent in the photograph, allows the use of boom lengths previously considered impractical. Circle No. 22.

MORE NEW EQUIPMENT . . . AND NEW LITERATURE

FRACTIONAL HORSEPOWER MOTORS from 1/20 thru 3/4 hp are offered by Reliance Electric and Engineering Company. An eight-page bulletin gives a comprehensive description of the construction and design details of the new Duty Master FHP motors. Circle No. 1.

SECTIONAL BELT CONVEYOR with exclusive bent-plate decking assures easy installation of components plus protection for return run of belt. Details are given in Stephens-Adamson Bulletin 458. Circle No. 2.

MINE CAR LOADER introduced by Gardner-Denver Company is the newest, most powerful, and has the most advanced design available. Full utilization of power is possible because the weight distribution of the machine and the force leverages have been balanced with the highest horsepower available. Circle No. 10.

ADJUSTABLE SPEED DRIVES from Louis Allis Company are described in their new 6-page Bulletin 2900 which gives details on types, available ratings, speed ranges, type enclosures, associated controls, and special modifications. Circle No. 17.

WELDMESH WIRE LAGGING for roof and wall support in underground mines is economical, quick to install, and greatly reduces fire risk. The B.R.C. Engineering Company of England will send complete details to those who circle No. 18.

BORING EQUIPMENT power transmission units by Ka-Mo Tools of the Kwik-Mix Company are described in a new illustrated 12-page brochure just released by the company. Circle No. 23.

POWER POSITIONING is the subject of the latest 10-page bulletin just issued by Hanna Engineering Works. What the Hanna Power Positioner is, what it will do, and the cost benefits it will provide are detailed in this informative technical publication. Circle No. 24.

HYDRO-GRAVITY CONCENTRATOR has a capacity of 12 to 15 tons per hour concentrating lead, silver, gold, and other metals having a specific gravity equal or above that of lead. This efficient machine has been improved over earlier models and is available to the mining industry by Tailings & Dump Concentrating Company. Circle No. 20.

EXCAVATORS: A 16-page pictorial catalog fully describing the new model 4500 Vicon (6-yard shovel or 7-yard dragline capacity) has just been published by Manitowoc Engineering Corporation. Circle No. 71.

HELICOPTERS are the subject of the latest 12-page folder issued by the Hiller Aircraft Corporation which describes the latest commercial models, performance charts, and applications. Circle No. 28.

SWITCHGEAR of all types for mining and industrial users is manufactured by Metzner & Jung of Western Germany. The Fanal line includes hand-operated and electrical switches, electromagnetic valves, distribution and control systems, thermostats, relays and other quality electrical apparatus. For booklets, brochures, and details circle No. 26.

CRAWLER CRANE-EXCAVATORS are the subject of a new brochure released by Koehring Company which describes with photographs and copy how Models 305 and 405 Excavators perform on various jobs. Circle No. 33.

AIR HOSE: A new heavy duty air hose for quarries and mines has been developed by Dayton Industrial Products Company that is capable of maintaining working pressures higher than any previous Dayton hose. Circle No. 35.

APRIL 1961

CIRCLE
NUMBERS
OF ITEMS
YOU
DESIRE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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71	72	73	74	75	76	77	78	79	80
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91	92	93	94	95	96	97	98	99	100

Also send further free information on the equipment advertised on pages:

Pages _____ Product _____ Manufacturer _____

Pages _____ Product _____ Manufacturer _____

Company or Firm _____
(Print Clearly)

To Attention of _____ Address _____

City _____ Zone _____ State _____ Country _____

IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business _____
(Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position _____
(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

APRIL 1961

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(Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position _____
(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

List information
you want MINING
WORLD to obtain for
you on this card. WE'LL
DO THE REST. No
postage necessary
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SLUDGE PUMP: Chicago Pneumatic has announced the development of the new CP-71 Sludge Pump, a lightweight scavenger designed to handle liquid containing up to 15 percent solids. Circle No. 42.

FILTER MEDIA: How better results in filtration can be achieved through scientific filter media selection is described in an attractive eight-page bulletin released by The Eimco Corporation. Circle No. 47.

RADIANT QUARTZ OVENS for baking and curing problems are detailed in an eight-page brochure just released by the Cleveland Process Corporation. Graphs, charts, and photos of "on-the-job" applications are given. Circle No. 68.

FURNACES for roasting, calcining, drying and incinerating ores, sludges, chemicals, and organic materials are designed and built to your exact requirements by Pacific Foundry and Metallurgy Company. For information circle No. 65.

GAS DETECTION and analysis with the new GC-2A Gas Chromatograph is described in a 15-page brochure published by Beckman Instruments, Inc. Circle No. 66.

PINCH VALVES are the subject of Catalog No. 609 issued by Mine and Smelter Supply Company. These automated valve systems control the circuitry for any operating requirements. Circle No. 67.

ROPE THREADS on Sandvik Coromant bits and steels are smooth, shallow, and rounded, permitting easy, quick hand uncoupling according to Atlas Copco. For information on how to get above-average bit and rod life, up to double the footage between sharpenings, and straighter, cleaner holes circle No. 62.

EQUIPMENT for the mineral and chemical processing industries is described with photographs and specifications in a new eight-page bulletin just published by Denver Equipment Company. Circle No. 69.

1961 SALES GUIDE to the United States mine market is a detailed, comprehensive 46-page booklet that itemizes all major new mining projects; gives statistical summaries of ore producers, mills, smelters, and refineries; a report on future mining trends; plus a directory of major United States and South American mining properties. Cost of this information-packed volume is only \$5.00. Circle No. 19.

SAMPLE SPLITTER: A new portable sample splitter has been announced by Gilson Screen Company. The Porta Splitter halves and quarters samples of about 1/4-cubic foot in sizes from sand up to two inches aggregate. Circle No. 30.

TRACTOR SHOVEL that has extra dumping height is the HD-6G made by Allis-Chalmers International. This 1 1/2 cubic yard, crawler mounted, front-end loader offers superior performance and greater dependability. For information circle No. 64.

DIESEL ENGINES for mobile and portable machinery are described in Bulletin 950,283 by Cummins Engine Company. This 12-page illustrated bulletin contains specifications and data on the V12-525 and VT12-700 models. Circle No. 32.

ELECTRIC MOTORS: Eight-page Bulletin 2651 issued by The Louis Allis Company outlines an extensive line of electric motors to meet a broad field of application requirements. Circle No. 37.

SHEAVE BLOCKS: The new, automatic centering "F" series of Pacific quick-opening sheave blocks are featured in Bulletin No. 305 offered by Alloy Steel & Metals Company. Bulletin describes complete line of Pacific sheave blocks, including full plate blocks, wide throat carrying blocks, tail block assemblies, as well as sheave anchors, all built for hard service. Circle No. 27.

COMPACT MOBILE RADIOS are the subject of Bulletin ECR-870 just released by General Electric Company. The publication contains battery drain charts, installation information, and other equipment details on the G-E Pacer two-way radio equipment. Circle No. 36.

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Tough Backing for Crusher Parts

A new, tough, resilient, lightweight, non-metallic backing for manganese crusher parts involving a new method of application has been introduced by Nordberg Manufacturing Company. The new backing agent, called Nordbak, can be poured at room temperature without the special pouring equipment or precautionary measures usually associated with metallic backing agents.

With Nordbak no special preparation of the wearing part or its mating member is necessary, and intimate initial support of the manganese is provided. Mixing and pouring of Nordbak is done at the crushing site. Circle No. 76.



Automatic Sample Splitter

For the accurate taking of average samples from fine sized material in the range of 4 to 0 mm, the WEDAG Company of Bochum, West Germany, has constructed a new automatic sample splitter.

The sample is first mixed in a six liter tank. The feed is then reduced, and the sample divided into four equal portions; each automatically poured into a bottle. The capacity of each bottle is 1/20th the amount fed to the mixer.

By the elimination of manual control for mixing and reduction of the sample, the new machine assures high accuracy for use in the laboratory and for arbitration purposes. Circle No. 25.

New Variable Speed Drives

Western Gear Corporation announces the design and manufacture of a complete line of mechanical variable speed drives. "Vari-Master's" are available in three sizes, covering the horsepower range of from 1 to 10 hp with a wide speed range of up to 8 to 1 ratio of speed variation. They are offered in Drip Proof, Totally Enclosed, and Explosion Proof design. Circle No. 82.



New Versatile Shuttle Car

Capacity, power and structural strength are features of the new, big AC shuttle car offered by the Goodman Manufacturing Company for use in mining, metals, non-metallic minerals and coal. With a basic height of 44 or 49 inches and a width of 96 or 106 inches the car is easily capable of transporting 13 tons of ore, a payload that can be increased with the addition of 6 inch or 12 inch sideboards.

An 80 horsepower traction motor with two sets of windings provides for two-speed operation without the use of clutches and torque converter, and also permits the use of simple electrical, mechanical and hydraulic systems. A 26 horsepower motor powers a mechanical conveyor drive and the hydraulic system. Circle No. 81.

Oil Condition Indicator

For gasoline engine users seeking higher reliability and lower operating costs, the Oil Condition Indicator Model G made by the Gerin Corporation will be of interest.

The Oil Condition Indicator is a gauge-type meter which shows when the crankcase oil is affected by fuel dilution, dead filters, wrong grade make-up oil, leakage of water or anti-freeze, etc. It can be read at a glance with the engine running or stopped, and permits a daily reading on oil condition by anyone. Circle No. 6.



New Rotary Drill Rig Line

LeRoi presents a powerful new line of mechanical drive rotary drills for bit size of 3 to 4 1/2 and 6 to 7 3/8 inches. Designated the LRD-2 and the LRD-3 these units are truck, crawler or wheel mounted for rotary or down-the-hole drilling. Circle No. 11.

Fight Mine Fires With Foam

The world's biggest bubble gun, capable of producing an ocean of foam within a few minutes, has been introduced by the Safety Development Corporation of Greensburg, Pennsylvania, for use in fighting mine fires. The Hi-Ex system consists of a portable foam generator, pump and accessories that are capable of generating 12,000 cubic feet of foam per minute and driving it 2,000 feet from the mouth of the machine. The bubbles, generated at a 1000-to-1 expansion ratio, compared to regular fire fighting foam with its 10-to-1 ratio, acts as a plug filling every air space in the fire area, and in so doing starves the flames for oxygen. Circle No. 12.



Beryllium Stream Analyser

A new beryllium stream analyser has been developed by the Boulder Scientific Company. This instrument is capable of continuously measuring the beryllium content of a process stream consisting of a solution or slurry. Beryllium concentrations in the microgram per milliliter range can be measured with 10 percent accuracy in about five minutes. The instrument's detection principle is based on the production of neutrons by the reaction of gamma rays with beryllium followed by an indirect measurement of the emitted neutrons. The instrument has been approved by the Atomic Energy Commission. Circle No. 14.

Rebuild Worn Hoist Drums

A new service has started which enables the mining industry to have their badly worn grooved drums completely rebuilt or repaired for any size wire rope by the LeBus Engineering Co. of Texas.

This service can be performed at the mine site where the hoisting drum is operating. It entails no machine work on the drum in order to rebuild and re-groove. Work is done with special groove bar segments fitted to any size drum. Circle No. 7.

NEWSMAKERS in world mining



H. RIEMER



E. M. FURNESS



A. GAKNER



R. ELLERMAN



J. A. ENGSTROM



K. INGO

Hugo Riemer has been elected president of United States Borax & Chemical Corporation. Mr. Riemer, former executive vice president, succeeds **James M. Gerstley**, who has been named vice chairman of the board of directors.

E. M. Furness, former assistant executive vice president of Reserve Mining Company, Silver Bay, Minnesota, has been elected vice president in charge of operations. In his new position, Mr. Furness will supervise operation of Reserve's taconite mining and processing facilities at Babbitt and Silver Bay, Minnesota.

Sir John Wrightson, Bt., chairman of Head Wrightson & Co. Ltd., is visiting Durgapuri Steelworks in India. His visit also coincides with the opening of the new Head Wrightson India Ltd. operations in Calcutta.

Clarence Shelton, foreman at the slime plant, and **Francis A. Nance**, time-keeper at the mill and leaching plant of Inspiration Consolidated Copper Company, Inspiration, Arizona, have retired after 37 years of service with the company.

Robert C. Temps has been named chief geologist for the Compania de Acero del Pacifico, Vallenar, Chile. He left a position as chief mining engineer of Quebec Cartier Mining Company, a subsidiary of U. S. Steel Corporation, to take the new post in Chile.

G. M. Godfrey, former mine manager of the Northspan Uranium Mines' Spanish American property, at Elliot Lake, Ontario, Canada, has been appointed mine manager of the Nordic Division of Rio Algom Mines Ltd., Elliot Lake, Ontario, Canada.

Michael Horst Kroen has joined the Zurich, Switzerland, staff of Climax Molybdenum Company. He comes to Climax after serving as research engineer for the Institut de Recherches de la Siderurgie, St. Germain-en-Laye, France, for the past two years.

Walter Russert, assistant general superintendent of mines for the Anaconda Company since 1943, has retired. As assistant general superintendent, Mr. Russert was in charge of Anaconda's Stewart, Mountain Con, and Original mines at Butte, Montana.

Lyle J. Mulholland, quality control director at the Hayden, Arizona, Ray Mines Division of Kennecott Copper Corporation, has been appointed test engineer at the smelter. Mr. Mulholland has been with Kennecott since 1951.

Alexander Gakner, formerly with the U. S. Bureau of Mines, has resigned to accept the position of assistant vice president of the international division of Royer and Roger, Inc., Washington, D. C. Mr. Gakner, an internationally known expert on the Soviet mineral economy, had joined the Bureau of Mines in 1952 as East European specialist. He is maintaining an office in Washington at 1000 Vermont Avenue, N. W.

Roy Ellerman has been appointed project manager of Federal-Gas Hills Partners' operations in Wyoming's Gas Hills District, succeeding **Raymond G. Lindlof**, newly assigned project manager of the Shirley Basin Partners' operations. Before joining Federal Resources Corporation and Gas Hills Uranium Company, Mr. Ellerman was chief metallurgist and mill superintendent of Stanleigh Uranium Mining Corporation, Ltd., at Elliot Lake, Ontario, Canada.

Ray Schultze has been elected chairman of the central New Mexico section of the American Institute of Mining, Metallurgical and Petroleum Engineers. Other newly elected officers are **Jack Q. Jones**, co-chairman; **Clyde N. Garman**, secretary-treasurer; and **Jim Owen** and **Earl Elstone**, executive committeemen.

Kenneth Rockey, vice president of Cerro de Pasco Mining Company has been decorated with the Chilean government's "Orden al Merito Bernardo O'Higgins" medal in recognition of his services to Chile.

Arthur Notman, United States mining consultant and recognized expert on the economics of mining, is currently on a tour of the Rhodesian copperbelt at the invitation of the Rhodesian Selection Trust.

Robert W. Bell, superintendent of mining at the Erie Mining Company, Hoyt Lakes, Minnesota, has been transferred to the Cleveland, Ohio, offices of Pickands Mather & Co. of Duluth, Minnesota, where he will be in charge of investigations of potential new mining properties for the company. Other new appointments within the company's Mesabi operations are **Walter L. Thomte**, superintendent of mining at the Hoyt Lakes plant, and **James E. Schelske**, new assistant superintendent of mining at the Erie Mining Company.

Norman A. Radford, formerly associated with the state of Idaho as geologist and soils engineer, has been appointed geologic engineer for the Trout Mining Company in Philipsburg, Montana.

John A. Engstrom, former unit manager for Cia. Minera de Penoles, S. A., a Mexican subsidiary of American Metal Climax, Inc., has been named general manager of the El Potosi Mining Company, the Chihuahua, Mexico, subsidiary of the Howe Sound Company of New York, New York.

Krister Ingo, of Bolidens Gruvaktiebolag, Boliden, Sweden, is on a tour of mines and mills in the western United States after attending the four-day International Mines Symposium at Rolla, Missouri.

J. K. Brooke, former administrative mining engineer with Kaiser Aluminum Company, and **R. M. Dreyer**, former assistant chief geologist with Reynolds Metals Company and chief geologist for Kaiser Aluminum Company, have opened a consulting practice in mining engineering, mining geology, and mining geophysics. Their office is at 465 California Street, San Francisco, California.

Ernest R. Rodriguez, associated with the U.S. Bureau of Mines since 1949 has been named chief of the Bureau's new Spokane, Washington office of mining research.

Clifford James, well-known mining engineer, has been named general manager of the Beryllium Resources de Mexico, S.A., Ensenada gold mine, a subsidiary of Beryllium Resources, Inc.

George H. Cobb, former vice president of exploration for Kerr-McGee Oil Industries, Inc., has been appointed company vice president in charge of minerals. His promotion is one of several personnel changes within Kerr-McGee.

Clarence H. Sleeman, former chief mining and development engineer for Jones & Laughlin Steel Corporation's ore mines and quarries division, has joined Kopper Company, Inc., of Pittsburgh, Pennsylvania, as chief mining engineer for its foreign department. He will work primarily on development of the El Algarrobo iron ore deposit of Compania del Acero del Pacifico, S.A., in Chile.

Fred W. Wink, president of the Wink Corporation of San Francisco, will be in Togo, West Africa, until May to assist in the development of the mineral resources of Togo and to instruct local men in the use of exploration diamond drilling equipment. The work is being done under the auspices of the newly formed African Diamond Drilling and Manufacturing Company, Ltd., of Lome, Togo, of which Mr. Wink is also president.

Metal & Mineral Prices

U. S. A.

March 20, 1961

METALS

COPPER: Electrolytic, Delivered F.o.b. cars, Valley basis (pound) ..	29.00c
Lake, Delivered, destinations, USA ..	29.00c
Foreign, Delivered, destinations, USA ..	29.00c
LEAD: Common Grade, New York (Per pound) ..	11.00c
Tri-State Concentrate, 80% lead, per ton ..	\$125.16
ZINC: Prime Western: F.o.b. E. St. Louis (Per pound) ..	11.50c
Prime Western: Delivered New York ..	12.00c
Tri-State Concentrate, 60% zinc per ton ..	\$68.00
ALUMINUM: Primary 50 Pound Ingots (99.5% plus) (Per pound) ..	26.00c
ANTIMONY: Lone Star Brand, F.o.b. Laredo, in bulk (Per pound) ..	29.00c
BISMUTH: (in ton lots) price per pound ..	\$2.25
CADMIUM: Sticks and bars, 1 to 5 ton lots Price per pound ..	\$1.60
COBALT: 97-99%, keg of 500 pounds (Price per pound) ..	\$1.50
COLUMBIUM: Ingot ..	Nominal, per pound \$36.00-\$55.00
GERMANIUM: dioxide, high purity, gram ..	16.75-21.75c
LITHIUM: 98% (per pound) ..	\$9.00-\$12.00
MAGNESIUM: Ingots (99.8%) F.o.b. Velasco, Texas per pound ..	36.00c
MERCURY: Flasks, Small lots, New York ..	\$206.00-\$208.00
NICKEL: "F" Ingots (5 pounds) F.o.b. Port Colbourne, Ontario ..	75.50c
PLUTONIUM: To July 1, 1962 AEC will pay \$30.00 to \$40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram ..	\$30.00
SELENIUM: 99.5% per pound ..	\$6.50-\$7.00
TELLURIUM: Common grade, Per pound ..	\$4.00
THORIUM: per kilogram ..	\$43.00
TIN: Grade A Brands, New York (Per pound) Prompt delivery ..	103.50c
TITANIUM: 99.3% + Grade A-1 Sponge (Per pound) ..	\$1.50-\$1.60
URANIUM: Rod (0.790 U-235) \$16.00 Per Pound; Foil ..	\$16.75
U-235: Nominal (Per pound) ..	\$7.725
VANADIUM: 90% Grade ..	\$3.45
GOLD: United States Treasury Price ..	\$35.00 per ounce
London ..	\$35.16 per ounce
SILVER: Newly mined domestic, U.S. Treasury price per ounce ..	90.5c
Foreign Handy Harmon ..	91 3/4c
PLATINUM: Per ounce ..	\$82.00-\$85.00
ZIRCONIUM: Sponge, Per pound, Reactor Grade ..	\$5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: 10 to 12% BeO, F.o.b. mine, Colorado ..	\$46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9%, \$45; over 10.0%, \$48.00.	
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons.	
African (Rhodesian), 48% Cr ₂ O ₃ , 3 to 1 ratio ..	\$35.00-\$36.00
African (Transvaal), 48% Cr ₂ O ₃ , No ratio ..	\$26.00-\$28.00
Turkish, 48% Cr ₂ O ₃ , 3 to 1 chrome-iron ratio Nominal ..	\$36.00-\$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.	
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide, Nominal ..	\$1.10
IRON ORE: Lake Superior, Per gross ton Lower Lake Ports ..	
Mesabi, Non Bessemer, 51.5% Fe ..	\$11.45
Mesabi, Bessemer, 51.5% Fe ..	\$11.60
Old Range Non Bessemer ..	\$11.70
Old Range Bessemer ..	\$11.85
Lump: Plus 1/2-inch ..	\$12.85
Fines: Minus 1/2-inch ..	\$10.72
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit ..	24.00-25.00c
Brazilian, Atlantic Port, 68 to 90%, Long ton unit ..	22.00-25.00c
Venezuelan, Oranoco No. 1, 58% Fe, F.o.b. Porto Ordaz ..	\$8.95
MANGANESE ORE: Metallurgical grade, 48 to 50% Mn Long ton unit ..	\$0.95-\$1.00
Metallurgical grade, 46 to 48% Mn, Long ton unit ..	\$0.90-\$0.95
Metallurgical grade, 44 to 45% Mn, Long ton unit ..	\$0.85-\$0.90
Domestic U.S. Government, GSA Basis \$2.30 per unit for 48% Mn.	
MOLYBDENITE CONCENTRATE: 90% MoS ₂ , F.o.b. Climax, Colorado, Per pound Mo, plus container cost ..	\$1.25
TUNGSTEN CONCENTRATE: Domestic, 60% WO ₃ Per short ton unit ..	Nominal \$23.50
Foreign: 65% WO ₃ Per short ton unit (Scheelite) ..	Nominal \$19.00
Foreign: South American, Spanish, Portuguese ..	Nominal \$17.50
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U ₃ O ₈ in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.	
NON-METALLIC MINERALS	
BARITE: Oil well drilling, Minimum 4.25 specific gravity, per short ton ..	\$16.00
BENTONITE: Minus-200mesh, F.o.b. Wyoming, Per ton, carload lots ..	\$12.50
Oil Well grade, Packed in 100 pound paper bags ..	\$14.00
BORON: technical grade .. F.o.b. Boron California, Per ton ..	\$47.50
FLUORSPAR: Metallurgical grade, 72.5% effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines ..	\$37.00-\$41.00
Mexican, 70% F.o.b. border, Duty paid ..	\$26.00-\$27.00
Acid Grade, 97% CaF ₂ Bulk, F.o.b. mine ..	\$45.00-\$49.00
PERLITE: Crude: F.o.b. mine per short ton ..	\$3.00 to \$5.00
Plaster grades, Crushed and sized, F.o.b. plants ..	\$7.00 to \$9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas ..	\$22.50-\$23.50

London

March 20, 1961

Per Long Ton USA Equivalent cents per pound

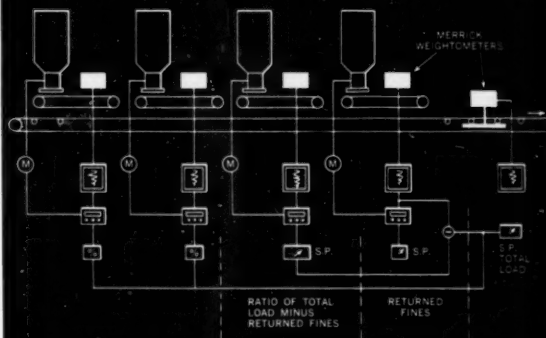
COPPER: Electrolytic, spot ..	\$224	0s 0d	28.00c
LEAD: Refined 99% ..	£ 67	0s 0d	8.38c
ZINC: Virgin, 98% ..	£ 86	5s 0d	10.78c
ALUMINUM: Ingot, 99.5% ..	£186	0s 0d	23.25c
ANTIMONY: Regulus, 99.6% ..	£210	0s 0d	26.25c
TIN: Standard, 99.75% ..	£814	10s 0d	101.81c
TUNGSTEN: Long ton unit ..	£ 0	123s 0d	\$17.22c

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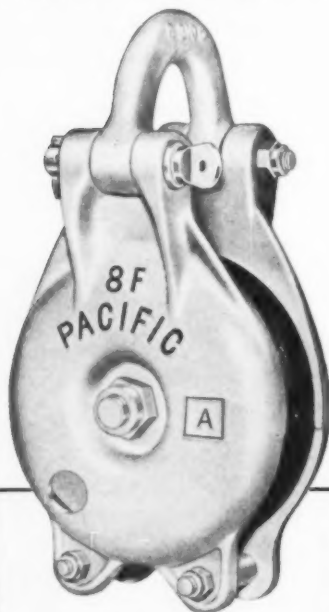
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Grab Samples

continued from page 3

design has allowed economies, are still lower.

Certainly no one questions that drilling of holes large enough to be classified as true shafts is a distinct possibility and worthwhile aim for the future. But to say that the experience to date indicates that present methods of rotary drilling and casing can be successfully employed, at least from a cost standpoint, for 7 foot or larger shafts as of today may be a somewhat optimistic interpretation of the facts as presented.

H. B. Spencer
President,
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CONVENTION CALENDAR

April 12, 13, 14. The first INTERNATIONAL SYMPOSIUM ON AGGLOMERATION, Sheraton Hotel, Philadelphia, Pennsylvania.

April 13, 14, and 15. PACIFIC NORTHWEST METALS AND MINERALS CONFERENCE sponsored by the AIME and the American Society of Metals. Davenport Hotel, Spokane, Washington.

April 13 and 14. Conference on RADIOISOTOPES IN THE MINING INDUSTRY, sponsored by the American Mining Congress, Brown Palace Hotel, Denver, Colorado

April 24 and 25. SOUTHWEST MINERALS INDUSTRY CONFERENCE, in conjunction with INDUSTRIAL METALS, Stardust Hotel, Las Vegas, Nevada.

May 1 and 2. Annual joint meeting of the AMERICAN ZINC INSTITUTE and the LEAD INDUSTRIES ASSOCIATION, Drake Hotel, Chicago, Illinois.

May 12, 13, and 14. The sixth annual URANIUM SYMPOSIUM, sponsored by the Central New Mexico section, AIME. Grants, New Mexico.

May 25 and 26. The 37th annual conference of the LAKE SUPERIOR MINES SAFETY COUNCIL, Hotel Duluth, Duluth, Minnesota.

October 2, 3, and 4. The NATIONAL FIRST-AID AND MINE-RESCUE CONTEST, Public Auditorium, Pittsburgh, Pennsylvania.

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INTERNATIONAL NEWS

Newmont Group Plans Pilot Mill At Copper Deposit in Africa

Palabora Mining Company Ltd., which has been investigating an extensive, relatively low-grade copper deposit in the Union of South Africa, will begin pilot plant tests of the ore. If the tests result in a decision to undertake full-scale development, it will necessitate an open pit mine, concentrator, and possibly a smelter.

The copper minerals, considered to be mainly malachite and azurite, occur on the property of the Phosphate Development Corporation, and beyond it. It is probable that Palabora is assured of getting full mining rights so full-scale operations can be started.

Palabora Mining was formed about four years ago by Newmont Mining Corporation, Rio Tinto Company of South Africa Ltd., and Transvaal Ore Company Ltd. to acquire prospecting rights over the deposit, located at Palabora on the Olifants river, Northeast Transvaal, about 75 miles east of Pietersburg. Options over much of the area have been obtained and applications made for further rights.

AEC Will Use Historical Basis For Uranium Belt Allocations

Although the Atomic Energy Commission has established production rates for mines containing approximately 85 percent of the nation's ore reserves developed as of November, 1958, this does not mean exclusion of other mining operations, according to recent AEC statements.

Many of the small independent mining operators, as well as a few larger ones fall in the category for which the AEC will consider using the historical production rate rather than developed ore reserves as a basis for establishing a market. Most of these properties, which have irregular deposits that under normal mining procedures are not developed far in advance of mining, are located in Colorado's Uravan Mineral Belt which also includes part of eastern Utah and northwestern New Mexico.

Although this area has a long history of production, the companies mining Uravan-type deposits traditionally operate with minimum developed ore reserves because of the character of the ore bodies, a fact recognized at the time of AEC's November, 1958 announcement.

In establishing an allocation for a mining property the AEC will operate on a case-by-case basis. The period from July 1, 1956 to June 30, 1960 will be used when the historical production rate is the basis.

The Grand Junction, Colorado, operations office of the AEC is now completing negotiations for extension of remaining mill contracts in the Uravan Mineral Belt, to provide for processing of ores from independent mining operations in addition to ores from properties owned or controlled by milling companies.

All information received from independent mining operations is now being reviewed by that office so allocations can be established for the eligible properties, and so that independent operators will be able to negotiate with the mills for an extended market when the mill contracts

have been executed. This will not affect present ore marketing arrangements between the mills and independent producers in the meantime.

There are an estimated 700 uranium mining properties in the western United States, but about 10 percent of these properties account for an estimated 90 percent of the uranium ore reserves of the nation. Slightly less than one-half of the presently active mining properties make up the remaining 15 percent of the estimated uranium ore reserves as of November, 1958. Thus the AEC still has to allocate ore reserves to more than 300 mining operations in the western states.

Chilean Company Plans For New Copper Refinery

National Mining Enterprise (Empresa Nacional de Minería) of Chile will build an electrolytic copper refinery to complement the new Las Ventanas copper smelter at Ventana de Quintero on the Pacific Coast, about 140 kilometers from Santiago. Both the refinery and smelter are designed to treat production from small and medium sized copper mining operations.

Size and capacity of the refinery are still undetermined, but plans are being considered for one unit with a capacity of 72,000 tons of electrolytic copper per year, and also for a larger one of 120,000-ton capacity.

Standard Beryllium Purchases Boa Vista Property in Brazil

The Boa Vista beryllium property in Brazil has been purchased from Icombra, S. A. by Standard Beryllium Corporation of New York City. The property consists of over 1,700 acres located about 200 miles north of Rio de Janeiro.

The beryllium at Boa Vista is in the form of beryl occurring in schists which are much more extensive than any found in the United States. In an area equal to 20 percent of the total, proven reserves amount to 2,100,000 tons, plus probable reserves of 864,000 tons.

Since the geology is consistent throughout the area, total indicated reserves are put at 14,820,000 tons, with assays indicating an average of three percent beryl.

Standard Beryllium is installing an automated mill at Boa Vista and will put in operation one or two more during this year. Each will process approximately 100,000 tons of crude ore annually. Additional beryl will be obtained by hand-cobbing as it has been in the past.

The new operator of the property had previously purchased ore from several mining companies in the area, but did not take part in the actual mining. Standard Beryllium owns a 25 percent equity in Icombra, S. A. and has a 50 percent interest with Icombra in the Pithorinha concession of Brazil. Standard Gold Corporation, a subsidiary, owns the mineral concession on a 36-square-mile area in French Guiana and plans to mine the indicated gold deposits there. Standard Beryllium also owns 50 percent of Micatron, S. A. of Sao Paulo, Brazil, which produces electronic components from pegmatite minerals.

Development of Two Ontario Iron Ore Properties Studied

Development plans are under consideration for two major iron ore properties in Ontario, one in the Temagami area where Strathgami Mining Company has outlined substantial tonnages of magnetic ore, and the other in the Nakina district where Anaconda Iron Ore (Ontario) Ltd. is pilot plant testing ore from two major zones on its magnetite property.

Ore at the Strathgami deposit grades about 30 to 35 percent Fe and can be concentrated readily. The project is under management of Cliffs of Canada Ltd. (wholly owned subsidiary of Cleveland Cliffs) which last year optioned some 80 claims in the area. In diamond drilling 28 holes totaling about 12,000 feet, Cliffs has indicated five potential pit areas. Further fill-in diamond drilling, bulk sampling, and extensive engineering is now planned. If the property is put into production, at a cost of some \$30,000,000, initial minimum output would be 1,000,000 tons of concentrate per year.

Development of the big Anaconda property at present depends on market conditions, but if plans proceed it would mean an investment of between \$70,000,000 and \$100,000,000 in the next ten years. The Canadian subsidiary of The Anaconda Company acquired the Nakina property over two years ago and completed its 100-ton pilot plant in late 1959. Tests have been encouraging, and the plant has produced about 8,000 tons of concentrate running 70 to 71 percent iron and less than 2 percent silica. Large tonnages of ore, averaging 25 to 30 percent Fe, have been developed in two general areas along a two-mile wide zone that is about 22 miles long. Pilot plant feed was first taken from the Briarcliffe ore body which is a steeply dipping zone 200 to 500 feet thick and over a mile long. Material from the other zone, the Two-Mile Lake, which is about two miles further west, is now being tested. This is a flatter dipping structure.

A minimum output of 2,000,000 tons of concentrate or pellets per year is the expected rate of production at the Nakina property if it is brought into production.

Mercury Plays Key Role in New Sodium-Water Fuel Cell

A new fuel cell to generate electricity by converting energy from contacting sodium and water is being developed for the United States Navy. The new device is reported to generate twice as much voltage as a hydrogen-oxygen cell.

The new cell means good news to mercury miners in that a mercury amalgam of sodium is used to prevent the explosive effects normal to contact of sodium with water. Energy from the reaction is converted directly into electric energy instead of into heat energy.

The M. W. Kellogg Company is developing a 100 horsepower prototype unit for the Navy. The unit will weigh between two and three pounds per kilowatt hour of capacity, and together with fuel storage space will be about 15 times lighter than regular electric batteries. It will operate at atmospheric pressure and at 150 to 160° temperature.

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Asia

JAPAN—Iron sand from the sea bottom around Kyushu Island will be used for manufacturing steel in a new project of the **Yawata Iron and Steel Company**. Yawata will join with the **Kinoshita San-sho** and **Ikeda Shoten** trading firms to form a subsidiary, **Ariake Iron and Steel Manufacturing Company** for management of the joint venture. An annual output of 40,000 tons of steel is expected. Yawata will furnish 50 percent of the initial capital of 100,000,000 yen for the operation. In addition to iron sand in the Ariake Sea and Kagoshima Bay near Kyushu, there are said to be extensive similar deposits in Tokyo Bay and in Uchiura Bay in Hokkaido.

MALAYA—Production of iron ore and bauxite increased during 1960, while gold output was less than in 1959. Iron ore production of 5,640,258 long tons set a new record, topping that of 1959 which was 3,760,684 long tons. The large increase for 1960 was mainly due to the surge of output from the iron mines in Perak. Malaya now has 24 iron mines employing 6,594 men. Total tonnage of bauxite produced during 1960 was 451,958, compared to 381,747 long tons in 1959. Production of gold was 20,745 troy ounces during 1960, nearly 6,000 ounces less than in the previous year.

PAKISTAN—Samples of high grade magnetite (about 62 percent Fe) have been sent from East Pakistan to West Germany and elsewhere for analysis. The ore was discovered on the beach of Cox's Bazar and samples collected from about a dozen places. Further investigations are being made by government geologists in cooperation with Dr. Herbarfeller of the **Krupp** interests in Germany. Aerial surveys have also indicated extensive patches of black sand on the 70-mile beach from Chittagong to the borders of Burma.

KOREA—A program for exportation of \$8,987,000 worth of minerals during the first half of this year has been drafted by the **Mining Bureau** of the Ministry of Commerce and Industry. The program, which is \$3,284,786 larger than for the same period in 1960, will include export of lead, 1,500 tons; iron, 120,000 tons; tungsten, 2,760; molybdenum 50; metallic bismuth, 30; amorphous graphite, 53,000; kaolin, 175,000, and talc, 10,000 tons.

INDIA—Three mines of the Kolar go'd mining group are now in operation—the **Mysore**, where reserves are nearly exhausted; the **Champion Reef**, which will continue for another six to eight years, and the **Nandydroog**, which can be operated for another 50 years. The mines are now managed by the state of Mysore, but the national government may take them over, giving the state royalties on gold and silver. Gold production during 1959-1960 was 4,772,587 grams.

MALAYA—The general managers of **Hong Kong Tin Ltd.** have recommended that consideration should again be given to possible development of an open-pit mine in the northern portion of the company's property, where previous dredging and grab dredger experimental work indicated an enriched area below the maximum digging depth of a dredge. The ground and bedrock in the area is such that only exploration through a mine-

hole dug by previous dredging would be helpful in determining the value of the deep deposit.

INDIA—A preliminary inspection by the **Geological Survey of India** indicates there are rich deposits of fluorspar in the Amba (Ambegaon) hills of Chota Udaipur subdivision in the Baroda district. A drilling program has been started at several places in a 10-square-mile area to determine the extent of the deposits, which were first located in 1958 by Dr. S. P. Choudhuri, consultant geologist for a Bombay firm holding a government prospecting license. India presently imports its fluorspar supply from the United Kingdom and China. There are also indications that iron may be found in the rivers of this area, which were rich sources of iron during the period of Moghul Emperors. In West Pakistan, initial drilling for iron ore at **Chichali** had reached a depth of 443 feet by the end of November. Drilling in other areas will be undertaken to check the continuity of the iron ore deposits.

KOREA—The government is studying a proposal from **Austrian and Continental Engineers, Ltd.**, subsidiary of the **Wheelerlock Marken Company** of Hong Kong, to build a hydroelectric plant in South Korea, with payment for the construction to be made by the South Korean government in the form of tungsten ore or other minerals within five to seven years after the plant is completed. A West German firm, **Siemens**, has offered a ten-year loan of \$12,350,000 for construction of a 110,000-kilowatt thermal power plant in the coal mining town of Yongwol on the east coast.

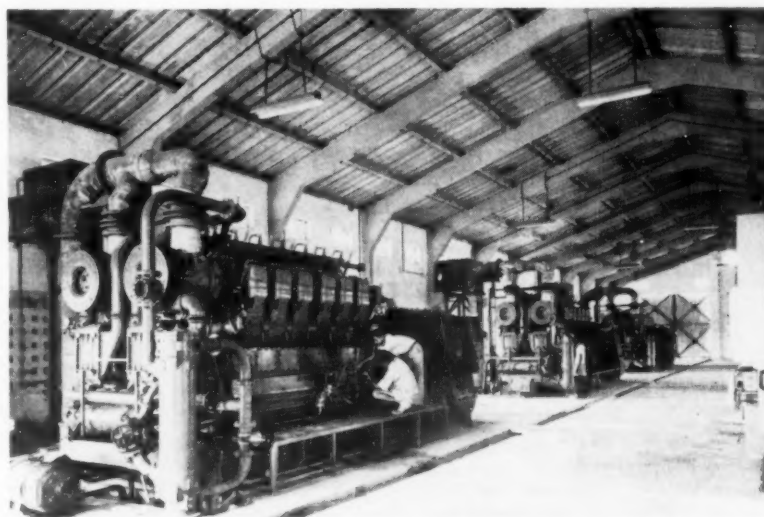
THAILAND—Investigation by **Tromal Prospecting Ltd.** for tin in sea areas off

the coast of Thailand has proved one area which has possibilities and is under study for future development. **Tromal Prospecting** is a subsidiary of **Sungei Besi Mines Ltd.**

INDIA—Preliminary work on the Indo-Italian aluminum project using bauxite from the Salem district of Madras was started in March, with production scheduled to begin a year later. The plant at Mettor is expected to reach its full production capacity of 10,000 tons per year by 1963. The aluminum plant will be operated by the **Madras Aluminum Company** in cooperation with **Montecatini** of Italy. Most of the machinery, valued at 38,000,000 Rupees (about \$8,000,000) will come from Italy. A 1,000-ton shipment of bauxite will be sent to Italy this spring for analysis so that the plant can be designed for the most efficient method of treating the ore, which is considered easy to process.

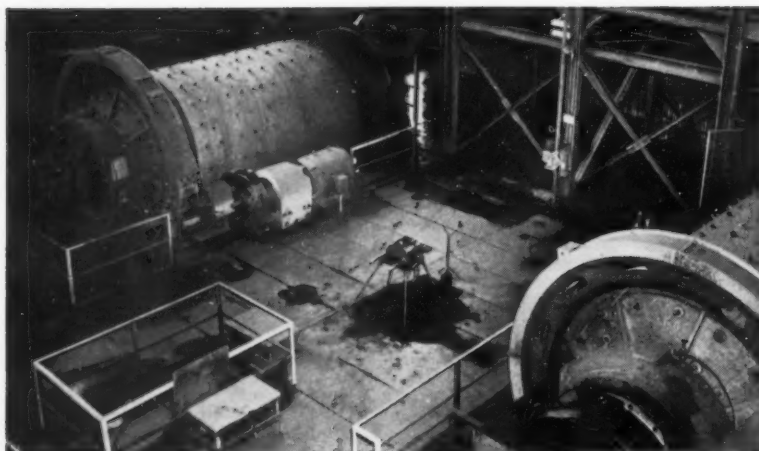
JAPAN—Production of aluminum by Japanese firms for the fiscal year beginning April 1 is expected to reach nearly 175,000 short tons. Although Japan has no bauxite deposits of its own, producers expect to have no difficulty in obtaining the necessary amount, close to 1,000,000 tons, to fulfill requirements. Contracts have been negotiated to import bauxite from Indonesia, Borneo, and Malaya.

MALAYA—Imports of tin concentrates into the Federation of Malay and Singapore in 1960 totalled 29,711 long tons with a metal content of 21,487 long tons. Exports of tin metal for the year amounted to 76,367 long tons. Deliveries of ore from Malayan tin mines to smelters, which includes stockpiled quantities, totalled 57,467 long tons. Production total was 51,979 long tons.



Movable Substations at Open-Pit Mine in India

Standby power for pumping at an open-pit mine near Madras, India, is supplied by two movable substations that start automatically and supply emergency power for submersible pumps which keep the mine workings dry. Each substation houses three Diesel-electric generator sets and associated switchgear which have their own 110-volt batteries for control, solenoids and emergency lighting, plus a 24-volt battery for the 3-horsepower priming pump. Controls of each set are self-contained so that substations can be moved completely as the face of the mine advances. When the Diesel generators are running at correct speed and voltage, they trip out the transformer breaker and close the alternator breaker which are electrically interlocked to prevent parallel operation. The substations were supplied by The English Electric Company Ltd. for the Neyveli Lignite Corporation (Private) Ltd. of Madras.



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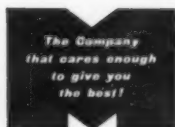
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BRITISH COLUMBIA—Granby Mining Company Ltd. plans to purchase from Silver Standard Mines Ltd. its Harit Harbor iron ore property on Queen Charlotte Islands for \$1,000,000 plus royalties on ore shipments. Ore reserves are estimated at 2,626,000 tons averaging 51.9 percent iron, which can be mined by low-cost continuous methods. Last fall Silver Standard held negotiations with Sumitomo Shoji Kaisha Ltd. of Japan for purchase of 1,000,000 tons of 62 percent iron concentrate over a four-year period beginning in 1962. Sumitomo was to aid in preparing the property for production by advancing \$1,000,000, with Canadian interests expected to furnish the balance. Granby is the parent company of Phoenix Copper Company Ltd., which operates an open-pit copper mine and a 1,000-ton-per-day mill near Greenwood, British Columbia.

NEWFOUNDLAND—A yearly output of some 20,000 tons of acid grade fluor-spar is anticipated by St. Lawrence Corporation of Newfoundland Ltd., which resumed operations last year after a three-year lapse. After a development and rehabilitation program about 25,000 tons of ore were mined from its various properties in 1960. Most of the 1960 shipments, totalling 7,100 tons of metallurgical grade mineral and flotation mill concentrate, went to plants of affiliates in the United States. The company is presently sinking a shaft on the Valley vein, a recent discovery which appears to be the best yet located. The new vein, which has been traced over 1,000 feet, is 1,000 feet west of, and parallel to, the Haypoock Pond and Blue Beach vein systems. St. Lawrence plans to deepen the Blue Beach shaft to open about 150,000 tons of ore, and extend the shaft on the Red Head vein where a westward drifting program will be started. Water problems have been encountered in development of the Hares Ears vein so work there will be suspended for a time.

QUEBEC—Several major steel companies are reportedly showing interest in the major magnetite iron deposits on three concessions held by Great Whale Iron Mines Ltd. which are about 50 miles southeast of Great Whale River on the east side of Hudson Bay. The deposits are estimated to contain over 1,000,000,000 tons of concentrating type open-pit iron ore, averaging 36.0 percent Fe. This is calculated to produce 383,000,000 tons of a concentrate containing 67.1 percent iron and 5.5 percent silica using an average grind of 85 percent minus 200 mesh. The company, owned by Belcher Mining Corporation, Wright-Hargreaves Mines and Malartic Gold Fields, has spent some \$750,000 in the last few years on exploration, laboratory work and testing of the ore. Current plans include construction of an airstrip and access roads to the various ore bodies.

BRITISH COLUMBIA—Consolidated Mining and Smelting Company of Canada, Ltd., is revamping its Trail zinc treatment facilities at a cost of \$3,000,000. Capacity of the sulphide leaching process will be increased to make up for declining production of the oxide leaching plant. Smelter residues, stockpiled and processed for years at a rate of about 75 tons of refined zinc daily, will be exhausted by early 1962. Additional con-

concentrates will be sought. Major items in the conversion project are a 350-ton-per-day suspension roaster and a bag house for dust recovery from the roaster gases. Ralph D. Perry is vice president and general manager at Trail.

ONTARIO—The 100th anniversary of gold mining in Canada was noted during the annual meeting and convention of the Prospectors, and Developers Association in Toronto, March 5, 6, 7, and 8. A feature of the Tuesday, March 7, session in honor of Canada's Gold Day, was an address by George O. Argall, Jr., editor of *MINING WORLD*, San Francisco, California, entitled "The United States and Canada Must Produce More Gold and Silver." Other highlights of the four-day meeting included "Tin-Tungsten-Molybdenum Mineralization, Mount Pleasant Area, New Brunswick" by P. T. Black of **Keneco Exploration (Canada) Ltd.**; "More Mines in the Sixties" by J. A. Harquail, a consulting engineer in Toronto; "World's Silver Supply—Present and Future" by J. Edgar and S. E. Garrett of **Sunshine Mining Company** of Spokane, Washington, and "Geology of the Watts Lake Asbestos Area, Ungava," R. L. Chessman, chief geologist with the **Saskatchewan Department of Mineral Resources**. A symposium on the subject "Does the World Need Gold" was also presented on Gold Day.

BRITISH COLUMBIA—**Ottawa Silver Mining & Milling Company** has started driving a new lower adit at its **Ottawa** mine in the Slokan district. The new tunnel will gain 100 feet of depth below the No. 8 level ore body from which a small crew has been shipping high grade silver ore. The firm has canceled a lease on the upper workings and has taken over all operations at the property. Thomas C. Hughes, of Spokane, Washington, is president.

QUEBEC—Preparations by **Mattagami Lake Mines** for putting its multi-million-ton zinc-copper ore body into production by the fall of 1962 are proceeding at a good pace, with the underground program well under way and initial steps in plant and mill construction completed. After completion of sinking a six-compartment production shaft last October to a depth of 1,185 feet, lateral work was begun on the three main production levels, at the 350, 550 and 750-foot horizons, and some on the bottom, 1,000-foot level. Excavating for the main crusher station at the 870-foot horizon has been started and both ore and waste passes are being driven. About 2,100 feet of drifting and crosscutting, and 1,400 feet of raising have been completed. A few holes have been completed in the initial stope-layout drilling which generally confirm tonnage and grade indicated by surface drilling. Estimated tonnage of the main ore body is 21,000,000 averaging 12.76 percent zinc, 0.68 percent copper, 0.018 ounce of gold per ton and 1.31 ounces silver per ton, to a depth of 800 feet. Plans for surface construction and a concentrator that will produce at least 2,000 tons of ore per day are proceeding. The company is expected to start its major construction program next summer. A townsite at Mattagami selected by the Quebec government is located about six miles east of the mine and on the west bank of the Bell River. Construction of an all-weather highway to the area is nearly finished, and final arrangements are being made to provide hydroelectric power and build a 65-mile branch railroad.

BRITISH COLUMBIA—Extensive work is planned at the Pb-Ag-Co property in the Golden Mining District next summer. The claims, at an elevation of 7,100 feet, are near the **Mineral King** mine of **Sheep Creek Mines, Ltd.** Vincent R. Newbury, of Spokane, Washington, formerly of Silverton, Idaho, owns the claims.

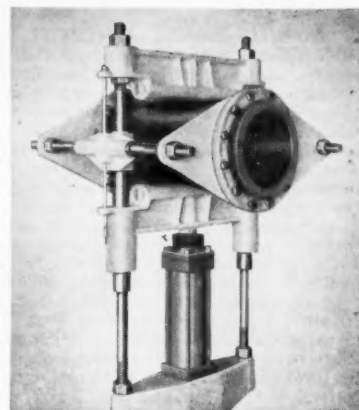
ONTARIO—The cost reduction program of **Denison Mines Ltd.** last year succeeded in reducing overall operating costs about \$1.00 per ton over the previous year, despite increased cost of materials, labor and services totalling almost 25 cents per ton. The grade of mill head increased to an average of 2.70 pounds U_3O_8 per ton as compared with 2.56 for 1959. Lower mining costs were achieved through centralization of working places, direct scraping of run-of-mine ore to conveyors, strict control of operating supplies, and from studies in rock mechanics. Milling costs were lowered by successful conversion from ball to pebble grinding and from economies in plant maintenance. During 1960 Denison milled 2,013,846 tons of uranium ore, for an average of 5,787 tons per day. The overall recovery for the year at 93.04 percent was slightly lower than the 1959 figure because of a higher insoluble loss on a more contaminated ore mined and, to a lesser degree, from the lower soluble iron content in leaching solutions as a result of conversion to pebble grinding. A total of 62,872 feet of linear work, 99 percent in ore, was completed during the year. The program prepared the tonnage mined and established positive reserves at 2,500,000 tons of a known grade. The company extended its three main conveyor arteries for a combined distance of 1,550 feet.

BRITISH COLUMBIA—Diamond drilling of a zinc-cadmium deposit at Adams Lake near Kamloops has been started by **Tombac Explorations, Ltd.**, which has optioned the property from Kenneth Calder, Ian Bennett and Harold Jones for a reported \$650,000.

ONTARIO—Successful bidder for the second equal installment in a 13-metric-ton order for uranium concentrate from the **Japan Atomic Fuel Corporation** was **Denison Mines Ltd.** The Denison bid in October was \$4.37 per pound. Last May, **Eldorado Mining & Refining Ltd.** received a similar 6.5 ton contract when its low bid of \$4.90 was accepted. Bids in May ranged from that price to a high of \$5.82, while Denison Mines bid of \$5.72 was the second highest. For the second half of the order bids ranged up to \$6.65.

ONTARIO—The first annual meeting and conference of the **Canadian Nuclear Association** will be held May 16 and 17 at the Lord Simcoe Hotel in Toronto. Among topics of discussion will be the practical application of Chalk River nuclear research for power generation, and the extent to which nuclear power will be applied in Canada within the next few years.

BRITISH COLUMBIA—**Skoookum Uranium, Inc.**, is resuming operations at its gold placer claims on Fifteen Mile Creek, southwest of Salmo, which were shut down in December because of water freezing in sluice boxes. Milder weather in recent weeks has permitted further work and produced very promising results. The company is putting a new dragline bucket into operation.



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Europe

FINLAND—Revised plans for establishing a steel mill in Finland call for a more extensive operation than originally proposed, and for the project to be completed in three stages. The company established for the undertaking, **Rautaruukki Oy**, is owned 75 percent by the government, with the rest of the capital furnished by four private heavy engineering companies. First stage of the project, a smelter with a capacity of over 300,000 tons per year, is due for completion in 1963-1964. The second stage will be a steel mill and the third, a rolling mill to produce medium and thick steel plate. Iron ore will come from three Finnish mines, one of which is now in production. The second will be opened next year and the third within two years. Although total cost of the project has not been announced, it has been estimated at over \$90,000,000. The Finnish parliament recently voted an appropriation for dredging the harbor at Raahen on the northwest coast of the Gulf of Bothnia in preparation for the project. Although it has been suggested that Soviet blast furnaces will not be suitable for use in this, a company spokesman said no decision has been made yet about awarding contracts. Since the Finns have little experience in this general field, foreign assistance will be required, but no commitments to either the West or the East have been made.

SPAIN—During the current worldwide shortage of potash, output from both French and Spanish mines has decreased somewhat. In France, output has

been less because of a slow-down strike, while in Spain an accident in the main shaft of one of the country's larger potash mines caused a ruptured lining, so that miners had to shift to a secondary shaft to continue operations. Loss in output is estimated at 20,000 tons.

YUGOSLAVIA—An increase in production of asbestos is planned at the **Stragari** mine 60 miles south of Belgrade, where the ore contains up to 15 percent asbestos. The mine, where development began in 1934 and was then interrupted by World War II, now produces about 6,000 tons per year. Output by 1965 is expected to be 15,000 tons of pure asbestos, including 6,000 tons of grades 3, 4, and 5. At present about 80 percent of the output is exported to the United States, while the remainder is used in manufacture of asbestos sheets for use in the building industry. The mine is highly mechanized and includes a large separation plant. Plans to improve the equipment are under discussion. Present reserves at Stragari are 5,000,000 tons.

ENGLAND—London Zinc Mills of Enfield have been granted licenses for production, use, and sale of Hydro-T-Metal, an alloy of zinc, titanium, manganese, chromium, and copper made by **Hydrometals, Inc.** of the United States. A firm called **Hydrometals, S. A.**, has also been formed by the United States firm with a Belgian group of companies to promote the metal in Europe.

NORWAY—Preliminary discussions by the state-owned aluminum company, **A/S Ardal and Sunndal Verk**, concern an expansion of capacity that will include a

new smelter to produce 100,000 tons of aluminum annually. Total cost of the project, including hydro-electric facilities, is estimated at nearly \$140,000,000. No decision has been announced yet concerning location of the smelter or when the three-year construction program will start.

EIRE—An \$11,000,000 industrial chemical plant will be built at Campile, County Wexford, by a new company, **Shamrock-Avoca Ltd.**, formed by **Shamrock Fertilizers** of Wicklow, **St. Patrick's Copper Mines Ltd.** of Avoca, and Canadian interests. Copper pyrites produced at the Avoca mines will be used as raw material to produce 115,000 tons of 100 percent acid per year. Fertilizers and various industrial chemicals will also be manufactured at the plant on which construction is to start this summer.

YUGOSLAVIA—Extensive geological investigation during the last few years indicate that iron ore deposits near Konjic, about 30 miles south of Sarajevo, warrant development. Reserves are estimated at several hundred million tons of varying quality. The deposit near Bijela, south of Konjic, has the highest grade ore, but smaller deposits have been located in areas near Vis, Majdan, Pecina, Suplji Kuk and Paljevina. Further investigation has shown that hematite ore extends for about 14 miles. Magnetite ore has been located in a triangular section between Jablanica, Prozor and Konjic. Ore from the Jablanica deposit is now being mined and used in the steel industry. Transportation of ore from the deposits in these areas presents no difficulty since a railroad is now under construc-

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tion. The exploration program for these deposits is being carried out by the **Moscar Geologic Institute** in collaboration with other similar Yugoslavian agencies.

NORWAY—A new Copper mine may be started in Bidjeagge in northern Norway where geological, geophysical, and drilling programs have been carried out by the government for the last several years. Excellent results have been reported from the exploration project and the drilling of six boreholes in the area.

SPAIN—S. M. Minera de Ponferrada is considering installation of an aerial tramway at its **Alto Bierzo** mine to transport ore from the 2,000-meter elevation to the railway station at Paramo. The tramway would be 24 kilometers in length, the longest in this country, and have a transport capacity of 350,000 tons per year.

YUGOSLAVIA—Production at the rate of 150,000 tons of high-grade ore yearly has started at the **Kishnica** mines, where reserves are estimated at 10,000,000 tons. The mine, second in size only to the **Trepca** mines, will later be operated jointly with the **Ajvalipa** mines and production increased so that total yearly output of the combined operation will be about 250,000 tons. The Kishnica property also has reserves of about 7,000,000 tons of lower grade ore, which will be mined later at the rate of some 360,000 tons per year.

FRANCE—Three European firms have formed a new company, the **Societe Industrielle du Zirconium**, to produce zirconium sponge and ingots, and undertake research in its application in atomic and chemical industries. Each of the companies, **Montecatini** of Italy, **Pechiney** of France and **Degussa Metallgesellschaft** of Germany, has a one-third interest in the new firm.

YUGOSLAVIA—Discovery of a new mineral in the Bor copper region has been announced by Dr. Charles B. Sclar of **Battelle Memorial Institute**, Columbus, Ohio, United States, co-discoverer with Matija Drovenik, mining geologist for the **Bor Copper Mining Corporation**. The mineral, a cubic copper-arsenic sulfide, was named lazarevite in honor of M. Lazarevic, pioneer investigator of the Bor region geology and ore deposits from 1908 to 1913. The mineral, which occurs as microscopic grains in copper are associated with enargite, luzonite, covellite, and pyrite, was discovered during a Battelle study on the mineralogy and geochemistry of germanium in sulfide copper ore. The study was sponsored by the Bor firm, whose copper deposits in Eastern Serbia are the largest single source of copper in Europe. The Battelle electron-probe microanalyzer was used to obtain critical information on the composition (Cu_3AsS_5 , ideally) of the new mineral.

GREECE—**International Nickel Company of Canada Ltd.** has been investigating the **Laryma** property in Greece as part of its world-wide exploration program, but has not yet acquired an interest in the nickel property.

SPAIN—A mercury reduction plant is being built by the **Astur Belga de Minas S. A.** at the **Esperanza** mines near Mieres. The plant, designed by the **Gould Company**, will have a capacity of 150 tons per day, to produce 15,000 flasks of mercury annually.

Latin America

BOLIVIA—A West German commission of geologists and engineers is examining the **Mutun** iron ore deposit to determine extent of reserves, quality of the ore, and best methods of mining the ore. The Mutun deposit, considered by some authorities to be the largest of its kind in the world, is on the Brazil-Bolivian border in a relatively inaccessible location.

JAMAICA—A 61 percent increase in production was achieved in 1960 by **Alumina Jamaica Ltd.** for a total of 665,361 long tons of alumina, compared with 399,210 tons in 1959. This output required mining 1,597,236 tons of dry bauxite, except for 370 tons which were shipped to Canada for experimental purposes. For conversion purposes, 2,40 tons of the dry bauxite produces one ton of alumina. Alumina was exported to Canada, Norway, Sweden, India, British Guiana, and Trinidad.

CHILE—The **Mansfeld** interests of West Germany have joined with **Compania Minera Tamaya** for the purpose of blocking out copper deposits in the Andacolla area of Coquimbo province. An organization called **Cuprifer Andacolla S. A.** has been formed for the joint venture. Exploration work has begun and is expected to last two years.

MEXICO—A new 50-ton-per-day copper flotation mill has been put in operation at La Dura in the State of Sonora.

ARGENTINA—An alunite deposit located in Camarones (Chubut) near the Atlantic Coast is creating considerable interest since Argentina has no bauxite deposits and must now import all its aluminum. Reserves of the alunite deposit are estimated at 20,000,000 tons, and ore grade averages about 29 percent Al_2O_3 . Shape and structure of the ore mineralization indicate open pit methods could be used for mining.

MEXICO—A new manganese deposit has been located in Molango, State of Hidalgo, where Benito Aguirre has conducted extensive exploration. The deposit averages seven feet in thickness and ore is 40 percent manganese. A road is being built to the area, which is quite inaccessible at present.

CHILE—The \$1,700,000 mineral survey of northern Chile officially began recently when key men in the project met in Santiago. The survey, to be undertaken through aid of the United Nations Special Fund, will include the Department of Iquique in Tarapaca province, all of Atacama province, and the northern section of Coquimbo province. Initial equipment costing \$255,000 included 10 vehicles designed especially for desert travel, drilling and prospecting equipment, a topographic laboratory and a small airplane. Among those at the Santiago meeting were Miguel Albornoz, Dr. Ellis Dahlstrom, Bernard Bramson and Carlos Ruiz Fuller, director of Chile's **Institute of Geological Research**.

ARGENTINA—A cooperative mining group has begun operations at a small copper mine in the Department of Los Andes, Province of Salta. Since Argentina has negligible copper resources and has to import large amounts of the metal, mainly from Chile, the start of opera-

tions at the mine has stirred considerable local interest.

BOLIVIA—A marked improvement over 1959 figures was shown in the 1960 gold and platinum production of **South American Gold and Platinum Company's** dredging and mining operations in Colombia and Bolivia. Total gold output for the year was an estimated 190,191 fine ounces, against 136,000 the previous year. Platinum production will run about 19,000 ounces, compared with about 15,000 in 1959. Much of the increase in gold production resulted from the starting of gold dredging in Bolivia where the dredge in October reached the principal mining area on the Kaka River, northeast of La Paz. Bolivian operations contributed 24,500 ounces to the total output. In Colombia, the company's **Frontino Gold Mines Ltd.** operated its underground mining property continuously throughout the year. In 1959 the **Frontino** mine was closed for 63 days by a strike.

CHILE—In the modernization program of **Anglo-Lautaro Nitrate Corporation** the principal phases to be completed this year will be renewal of power generating equipment at the Pedro de Valdivia plant and mechanical loading facilities at the Port of Tocopilla. The program, begun in 1959, was aided by a \$4,000,000 Export-Import Bank credit.

PERU—Production at the **Toquepala** mine of **Southern Peru Copper Corporation**, which began operation in January, 1960, averaged about 14,000 short tons of blister copper monthly during the last half of 1960. Production during the year was above normal because of higher grade ore mined, but since January 1, 1961, the production rate has been lower.

VENEZUELA—Geologists of the Venezuelan Ministry of Mines and Hydrocarbons have located large phosphate deposits near the town of Lobatera, Tachira State. Experiments in using the phosphate as fertilizer have shown it to be especially suited for acid soil because of its heavy calcium carbonate content. A drilling program to determine extent of the deposits is being continued. The **Petrochemical Company** of Venezuela plans to build a processing plant based on a pilot-scale operation established near the deposits. The pilot plant produces one ton of fertilizer daily which is given free to farmers to encourage them to use fertilizer on soil in the area, much of which is eroded.

CHILE—A new plant for producing alloy grinding balls widely used to process Chilean copper ore is nearing completion on a site adjacent to **Compania de Acero del Pacifico S. A.**, which will supply steel for the plant. It is being built by **Armco Chile S. A.**, a new firm formed by the **Armco International Corporation** of Ohio, and **Companio Electro Metalurgica S. A.** of Santiago. Production is scheduled to start in June.

PARAGUAY—Technical advice concerning recently discovered iron deposits has been sought from the Argentine government. A geologist from that country is now studying the Paraguayan deposits and is expected to make a full report soon.

MEXICO—**Barita Nacional, S. A.**, which operates several barite mines in the states of Coahuila and Nueva Leon, is planning to erect a barite treatment plant in Linares, Nueva Leon.

Africa

GHANA—The Ghana government is submitting take-over bids for five of the country's gold mines now controlled by British interests. These are the four in the Western Selection and Development group—**Amalgamated Banket Areas Ltd.**, **Ariston Gold Mines (1929) Ltd.**, **Ghana Main Reef Ltd.**, and **Bibiana (1927) Ltd.**, sister company of **Ashanti Goldfields Corporation**. Combined production of these mines is about £56,000,000 worth of gold a year and combined assets are nearly £10,000,000. However, all have been hit by rising costs effected by the recent statutory wage increase in Ghana. No bid is being made for **Ashanti**, easily the richest mine in the country, nor for the smaller **Konongo**, which is a member of the **Consolidated Gold Fields** group. The company acting for the government in the bids states it has been authorized to submit proposals to acquire the entire share capitals of the gold mining firms. The government hopes to insure continuing employment for the 14,000 miners working in these operations, and to avoid closing the mines. Inflated operating costs, coupled with the government's denial of further aid to mines in financial difficulties, had earlier resulted in the decision of **Amalgamated Banket Areas** and **Bibiana** management that closing was inevitable. However, the recently passed **Mines (Abandonment) Bill** in Ghana imposes fines of up to £100,000 and ten-year imprisonment on management which closes mining properties without government permission.

LIBERIA—In the **Lamco** (Liberian-American-Swedish Minerals Company) joint venture to develop the Mount Nimba iron ore deposits (See **MINING WORLD**, February 1961, page 61), construction of the plant, the mining operation and transport of the ore to the port of Buchanan will be handled by the **Grangesberg Company**, which owns three-sevenths of the interest which Swedish firms have in the enterprise. **Bethlehem Steel Company** of the United States, which has a one-quarter interest in **Lamco**, will take about 25 percent of the output, while much of the remainder has been put under long-term contracts, principally with German steel firms. **Malmexport**, joint sales company of **Grangesberg** and **LKAB** of Sweden, will handle sales of **Lamco's**

share of the output, and **Grangesberg** ore carriers will transport the ore. The entire project will call for investment of some \$200,000,000.

UNION OF SOUTH AFRICA—Development of the new mine of **South African Manganese Ltd.** in the Kuruman area of northern Cape Province indicates a production of 240,000 tons of manganese a year can be expected in the near future. Unexpected areas of ferruginization in the manganese ore body had delayed development somewhat. Extension of the railroad from Sishen to the new mine area is to be completed early this year. Since output of higher grade ore in the Lohathla area workings of the company presents increasing difficulties, output from the new mine will probably be enlarged.

FEDERATION OF RHODESIA & NYASALAND—A Russian trade delegation that visited the Copperbelt recently was headed by A. I. Drobiasko, president of **Raznoimport**, the Soviet government agency which deals with procuring of all foreign imports. Russia buys about 20,000 tons of Copperbelt copper each year.

UNION OF SOUTH AFRICA—In sinking the No. 3 vertical ventilation shaft at its gold mine in the Far Western Rand, **Western Deep Levels Ltd.** made another intersection of the Ventersdorp Contact reef. At a depth of 6,413 feet, the reef, dipping 13° to the north, gave an average gold value of 11.86 dwts. per ton over a channel width of 34.73 inches equal to 412-inch/dwts. Samples were taken at five-foot intervals around the shaft perimeter. Two earlier shaft intersections of the same reef showed values of 495 and 315 inch/dwts. In limited drilling from surface a grade of 250 to 300 inch/dwts. was obtained. During 1960 the company sampled 2,290 feet for an average of 292 inch/dwts. **Western Deep Levels** has started work on a gold plant, and at the main vertical component of the No. 2 shaft system installation of a Koepe hoist is near completion. Sinking of the No. 3 subvertical ventilation shaft has been started.

MOROCCO—A mining cooperative to collect, buy, and sell lead-zinc ores on behalf of small mining operators in the Tafilalet province of East Morocco will be established by the government's mine de-

partment. According to Driss Slaoui, Minister of Commerce, Industry and Mines, the cooperative will start operating this month at Erfroud with a government subsidy and technical assistance from the Bureau of Mining Research. Profits from sales will finance later operations. About 6,000 "hole-in-the-ground" miners are expected to take part in the cooperative which will have a monopoly on lead-zinc ore trading within the province. According to Slaoui, a collective bargaining agreement for the mining industry is imminent, as well as establishment of training programs for Moroccan personnel at various mines. A government decree that will compel mining companies to invest some of their profits into the survey and development of mineral deposits is expected to go into force soon. The government is currently studying construction of a zinc smelter, another lead smelter, a copper-ore mill, and two mills for beneficiating iron ore at Khenifra in central Morocco and Tiznit in the south.

TANGANYIKA—Mineral exports during 1960 reached a new high value of £7,222,000,000 with increase in gold, lead concentrate, mica sheet and tin concentrate. Exports of diamonds and gypsum decreased from 1959, but the total value of diamond exports was higher.

Oceania

TASMANIA—An increase of production to 140,000 tons this year is anticipated by the **Electrolytic Zinc Company of Australia Ltd.**, Risdon, which produced 119,000 tons in 1960. The company has joined with **Broken Hill South Ltd.** and **North Broken Hill Ltd.** in exploring the former's promising lead-zinc areas at Broken Hill. **Electrolytic Zinc** is also continuing its interest in southwestern Tasmania with the **Mount Lyell Mining and Railway Company Ltd.** of Queenstown, but no reports have been released about these activities recently.

REPUBLIC OF THE PHILIPPINES—Executives of **Benguet Consolidated, Inc.** and **Lepanto Consolidated Mining Company** were among Philippine mining industry men who recently proposed remedial measures to insure survival of their operations and full use of the nation's natural resources. John C. Bardley, Benguet vice president, said that the gold mining industry will suggest to the Congress self-supporting legislation to provide that taxes paid by the industry, plus taxes coming from importation of goods bought with the foreign exchange created by sale of gold to the Central Bank, will compose a fund from which a subsidy can be paid. M. R. Arick, Lepanto vice president, proposed liberalization of the corporation law to encourage expansion of present mining firms; increase in maximum area that mining firms can lease; regulation of time period for claim-owners to develop claim property; tax exemption during development period, and a write-off tax provision for unsuccessful ventures.

PAPUA—Three new lode discoveries made late in 1960 by **Pacific Island Mines Ltd.**, on Misima Island bring the total bearing lodes known in the company's area to twenty. Two of the recent discoveries were made accidentally, while the third was made by prospecting. Reconnaissance trenching is being continued

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in an area north and northeast of the East Imbuginaina property which has already proved profitable. The No. 1 adit being driven northeast along the No. 1 lode from the east side of Imbuginaina Creek has advanced over 150 feet from the portal. The lode consists of rubbly quartz, breccia and gossanous material, with the gold mainly free and very finely divided. Width and value across the lode will be tested by crosscuts driven at regular intervals. The pilot plant built to determine grade of the deposits is scheduled to be in operation early this year. Construction of access roads and housing for the staff has been completed, and preliminary preparations for an airstrip are under way. **Australia Malay Tin Ltd.** has reportedly taken a small share holding in the company.

NETHERLANDS NEW GUINEA—Deposits of copper and gold have been located during an expedition into the Carstenz Mountains where the copper was found at an elevation of 3,500 meters. Provisional estimates put possible production of copper at 40,000 tons a year. A study of the deposits will be made by Freeport Sulphur Company of the United States and East Borneo Company Ltd., a Dutch firm.

NEW SOUTH WALES—Development of bauxite deposits in Weipa and elsewhere in the Australian commonwealth has provoked interest in possible establishment of an alumina industry in this state. The city of Newcastle wants the Premier of New South Wales to sell the city cheap power in order to attract an aluminum smelting industry following reported discussions with a Dr. John H.

Moses, chief geologist of **Reynolds Metals Company** of the United States. Simultaneously, Inverell in the northern part of the state, close to Armidale, has asked the Premier to consider on-the-spot extraction of alumina from bauxite. Although the bauxite in the Inverell area has been considered unsuitable for cheap alumina production, it may be that the deposits have not been sufficiently investigated.

QUEENSLAND—Tableland Tin N. L. at Mount Garnet anticipates returns of 80 to 100 tons of concentrate per month during the current year, since dredge digging capacity is about 4,000,000 cubic yards per year and the grade of the ground ahead of the dredge is better than the average of the property.

NORTHERN TERRITORY—Official announcement has been made of a new high-grade uranium orebody at Rum Jungle, a discovery that followed 18 months of extensive drilling. The new reserves are reportedly at least comparable with the total ore bodies mined to date in the Rum Jungle area. The two original deposits at Rum Jungle were depleted and mining abandoned in 1959.

NEW SOUTH WALES—New Broken Hill Consolidated Ltd. has recently entered into an agreement with **Consolidated Zinc Corporation Ltd.** to supply the major part of the zinc and lead concentrate requirements during the next 12 years for the new Imperial type smelter being built by **Sulphide Corporation Pty. Ltd.**, Consolidated Zinc subsidiary. Construction on the smelter at Cockle Creek began last summer, and it is scheduled

to start operation later this year. The smelter will use the vertical process developed by **Imperial Smelting Corporation** of Great Britain for simultaneous recovery of zinc and lead. By the new agreement New Broken Hill will acquire a 25 percent interest (\$4,200,000) in the ordinary share capital of Sulphide Corporation.

REPUBLIC OF THE PHILIPPINES—During the first 11 months of 1960, **Acoje Mining Company** produced 125,610 dry metric tons of chrome concentrate, compared with 112,498 tons in the same 1959 period. Value of shipments in the period totaled 5,990,175 Pesos, while in 1959 the value was 4,600,740 Pesos.

WESTERN AUSTRALIA—Establishment of a sponge-iron industry based on low-grade iron ore deposits in the Scott River on the southern coast is planned by **Mineral Mining and Exports Ltd.** The plant, which will cost £A 5,000,000, will have an annual capacity of 250,000 tons of sponge or pelletized iron and later be expanded in two stages to produce 500,000 and then 1,000,000 tons a year. The initial stage is scheduled to be completed by December 31, 1964.

NEW SOUTH WALES—An expansion at the Port Kembla steel works of **Broken Hill Pty. Company Ltd.** increases Australia's steel making potential to 4,000,000 tons a year. The expansion, plus others planned in this state and others, means ever-increasing demands for iron ore from the southern and western parts of the continent, with a possible small increase of ore imported from New Caledonia.

AMERICAN ZINC LEAD AND SMELTING COMPANY

Buyers of zinc concentrates suitable for smelting in retort and electrolytic smelting plants.

Address communications to
Ore Buying Department

Paul Brown Building
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**COPPER, GOLD
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**MINES AND SMELTER AT
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CONCENTRATING TABLES

- 8-Dunham Economy Type Tables, 50" x 11' 9" decks
- 9-Deister super-duty diagonal deck standard tables

DIESEL-ELECTRIC GENERATORS

- 1-15 KW Waukesha-Hesselman
- 1-30 KW Buda
- 1-75 KVA Caterpillar, D-13000
- 1-112 1/2 KVA Caterpillar, D-17000
- 1-250 KVA Buda model 8D-CS-2505

AIR TUGGER HOISTS

- 1-Ingersoll-Rand Model DU
- 3-Ingersoll-Rand Model D6U
- 4-Ingersoll-Rand Model IH
- 14-Sullivan Model E-111
- 2-Ingersoll-Rand Model EUA
- 1-Ingersoll-Rand Model 10-H
- 4-Gardner-Denver Model MK
- 2-Jay "Turnbair" Model F-113
- 1-Sullivan Model L-111
- 2-Ingersoll-Rand Model 10HR
- 1-Sullivan Model HA 3
- 3-Ingersoll-Rand Model HU

AIR SLUSHER HOISTS

- 1-Ingersoll-Rand Model HNNIJ
- 1-Sullivan Model FF-211
- 1-Sullivan Model F-212

ELECTRIC TUGGERS AND SLUSHERS

- 1-5 HP Sullivan, 2 drum slushers
- 1-5 HP Sullivan Tugger
- 2-7 1/2 HP Sullivan tuggers
- 1-15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
- 1-30 HP Joy Double Drum Slusher
- 1-60 HP Sullivan 3 Drum Slusher
- 1-10 HP Sullivan A-312 3 Drum Elec. Slusher
- 1-20 HP Sullivan AF-312 3 Drum Elec. Slusher

BALL AND ROD MILLS

- 1-4' x 4' Marcy Ball Mill
- 1-4' x 4 1/2' Hirsch Ball Mill
- 1-64 1/2' Hirsch Ball Mill
- 1-8' x 22' Hardinge Conical Ball Mill

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KEystone 4-5261

Denver 1, Colorado

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- 1-5' x 10' Denver Ball Mill

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- 1-16" x 10" McFarlane
- 1-40" x 20" Cedar Rapids

CRUSHERS

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- 4-2 1/4" x 3 1/2" New Morse Lab Crushers
- 3-4" x 6" New Morse Lab Crushers
- 1-5" x 6" New Morse Jaw Crusher
- 1-6" x 7 1/2" Hendy Crusher
- 1-10" x 16" Gruendler Roller Bearing Jaw Crusher
- 1-10" x 20" Pacific Crusher
- 1-20" x 36" Diamond Roller Bearing, Steel Plate, Jaw Crusher
- 1-1' 8" Traylor Type TY Gyratory Crusher

LOCOMOTIVES

- 1-1 Ton General Electric Battery Locomotive
- 1-1 1/2 Ton Mancha Trimmer
- 1-5 Ton Atlas Battery Locomotive
- 2-5 Ton General Electric Battery Locomotives
- 1-4 Ton Westinghouse Battery Locomotive
- 1-4 Ton General Electric Trolley Locomotive
- 1-4 Ton General Electric Battery Locomotive
- 1-6 Ton Goodman Trolley Locomotive
- 2-6 Ton Jeffrey Trolley Locomotives
- 2-6 Ton General Electric Battery Locomotives
- 1-7 Ton Atlas Battery Locomotive
- 2-8 Ton General Electric Battery Locomotives
- 3-8 Ton Ironton Battery Locomotives
- 1-9 Ton Whitcomb Battery Locomotive
- 4-10 Ton Atlas Battery Locomotives
- 2-10 Ton Jeffrey Trolley Locomotives
- 1-13 Ton Jeffrey Trolley Locomotive
- 1-13 Ton Goodman Trolley Locomotive
- 1-15 Ton Jeffrey Trolley Locomotive

FILTERS

- 1-3' x 4' Oliver Drum Filter
- 1-4' x 8' Morse Drum Filter
- 1-4' x 8' Eimco Drum Filter
- 1-6' x 3' Dorco Internal Type Filter
- 1-6' x 2' disc Oliver Leaf Filter
- 1-6' x 5' disc Morse Leaf Filter

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- 1-36" Sweetland #12
- 2-4' x 10' Kelly

FLOTATION MACHINES

- 1-1 cell Fagergren, 27" dia. type STD.
- 1-1 cell New Morse "Jetair" #7, 22" x 22" cell
- 1-1 cell Fagergren, 36" x 36" cell
- 1-2 cell Morse-Weinig, 37" x 37" cells
- 1-4 cell Morse-Weinig, #15, 24" x 24" cells
- 1-6 cell Stearns-Roger, 31" x 31" cells
- 1-4 cell Denver Sub-A, #21, 38" x 44" cells
- 1-6 cell Denver Sub-A, #21, 38" x 44" cells
- 1-6 cell Fagergren, 36" x 36" cells
- 1-2 cell Fagergren, 66" x 66" cells

LABORATORY EQUIPMENT

- 6-8" New Morse Disc Pulverizers
- 1-8" Braun Model UA Pulverizer with 2 HP integrally built motor
- 1-Braun 8" Sieve-Shaker
- 4-Grieve-Hendry Electric Drying Ovens, Model MT
- 1-5" x 6" Denver Jaw Crusher
- 4-4" x 6" New Morse Jaw Crushers
- 6-2 1/4" x 3 1/2" New Morse Jaw Crushers
- 2-12" Denver Lab Pressure Filters
- 2-12" Stearns-Roger Lab Pressure Filters
- 1-16" x 6" Lab Pub Mill
- 1-18" x 27" Revolving Dryer
- 2-14" x 19" Stearns-Roger Lab Ball Mills
- 2-2000 gram Denver Lab Flotation Cells

WELDERS

- 2-300 AMP Lincoln Welders
- 1-300 AMP G.E. Electric Welder
- 1-300 AMP Hobart Welder gas engine driven
- 1-300 AMP P & H Welder gas engine driven
- 1-400 AMP Westinghouse Electric Welder
- 1-400 AMP Allis-Chalmers Transformer Type Welder

DRYERS

- 1-8' 2" x 60" Squier Rotary Dryer, tire and roller type, 30 HP Motor and gear drive

SAVINGS!

USED ONLY 2 YEARS EXCELLENT SCREENING & CRUSHING EQUIPMENT

JAW CRUSHERS

- 1-30" x 42" Pioneer Jaw Crushers, roller bearing, 125 HP. Elliot TEFC Motors, 440 V. with Clark switch.

SCREENS

- 3-6' x 14' Hewitt-Robins, MH-11 Vibrex heavy duty scalping screens, 1 deck, 20 HP. TEFC Motors, 440 V.

FEEDERS

- 2-60" wide x 16'3" Pioneer Oro-Feeders, heavy duty manganese pans, 20 HP. U.S. Varidrive motors, 440 V.

BELT CONVEYORS

- 2-48" x 22' Belt Conveyors, 5 HP. Schrock motorized head pulley, 440 V.
- 1-60" x 30' Hewitt-Robins Belt Conveyor, 40 HP. Elliot Motor TEFC 440 V.

AGITATORS

- 2-4' x 5' Wemco, wood tank, 1 1/2 HP.

CONVEYORS

- 1-30" x 1600' Jeffrey Model 52H, Steel Frames
- 1-30" x 128' Stephens-Adamson, Complete with rail car loading station
- 1-60" x 150' Truss Frame, 100 HP.
- 1-42" x 1250' Link-Belt, Steel frame, 2-100 HP motors
- 1-36" x 645' Link Belt steel frame, 2-100 HP motors
- 1-42" x 870' Link Belt Steel frame with mobile stacker

COMPRESSORS

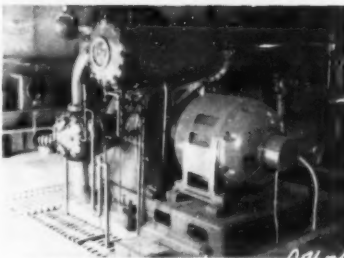
- 1-2500 cfm Sullivan, Class WN4, 2200 V.
- 1-1528 cfm Joy, WN114, 300 H.P. 2300 V. Exc.
- 1-Joy W99, 12 x 9. Less Motor
- 1-500 cfm Ing. Rand XRB, 100 HP. 440 V.

CRUSHERS

- 1-15 x 24 Traylor Blake Type, 40 H.P. 440 V.
- 1-2 1/4 x 3 Braun Chimpunk, 2 H.P.
- 1-10" x 30" Pacific Jaw, 40 H.P.
- 1-15" x 36" Universal, 50 H.P. 440 V.
- 1-4' Symons Standard Cone, 75 H.P.
- 1-4' Symons Std. Cone, 125 H.P. 440 V.

FEEDERS

- 10-Type 2DH Jeffrey Vibrating, 8 x 36" Pans
- 4-Type 4 Jeffrey Vibrating
- 1-F45A Syntrol Vibrating, 30" x 60" with controls



1528 CFM JOY COMPRESSOR

- 1-4' x 8' Jeffrey Vibrating Type 5, 440 V.
- 1-3' x 6' Jeffrey Traylor Grizzly Pan, 440 V.
- 1-30" x 13' Belt Ore, like new, 1 1/2 HP.
- 1-36" x 15' Link Belt, apron, 3 HP.

HOISTS, MINE SHAFT

- 1-10 H.P. Cœur d'Alene, Single Drum
- 1-50 H.P. Superior Lidgerwood, Tandem Drums, 220 V.
- 1-75 H.P. Puget Sound Single Drum, Post Brakes
- 1-100 H.P. Denver Engineering Single Drum, 100 H.P. 440 V.
- 1-150 H.P. Vulcan Denver Single Drum, New
- 1-600 H.P. Vulcan Wilkes Barre, 2 drum, 2300 V.
- 1-675 H.P. Vulcan Wilkes Barre, 2 drum, 2300 V.
- 1-165 H.P. Denver Eng. Works, 2 drum, 440 V.

HOISTS, TUGGERS & SLUSHERS

- 2-BFA 312 Joy, 3 drum, 440 V.
- 1-BF 312 Joy, 3 drum, 20 H.P. 440 V.
- 1-FF311 Joy, 3 drum, 10 H.P. 440 V.
- 7-FF211 Joy, 2 drum, 10 H.P. 440 V.
- 2-30 NM3D Ing. Rand, 2 drum, 30 H.P. 440 V.
- 1-20 NM2C Ing. Rand, 2 drum, 20 H.P. 440 V.
- 1-CA 311 Sullivan, 3 drum, 50 H.P. 440 V.
- 1-CF 211 Sullivan, 2 drum, 50 H.P. 440 V.
- 10-HB Gardner Denver, 1 drum, Air
- 8-L-111 Joy, 1 drum, Air
- 10-A5NNOH Ingersoll Rand 2 drum, air.

JIGS

- 1-16" x 24" Denver duplex, 1 1/2 HP.
- 1-12" x 18" Denver duplex
- 1-26" x 26" Bendalari Simplex
- 11-42" x 42" Yuba model M8 4 cell unit
- 1-42" x 42" Yuba, model M8 2 cell unit

LOCOMOTIVES

- 6-1 1/2 Ton Mancha battery, 18"-24" ga. Complete
- 1-1 1/2 Ton Atlas, Type J, 24" ga. w/charger.
- 1-3 1/2 Ton Mancha Type AN, Battery, 18" ga.
- 1-4 Ton Mancha, Titan, A battery, 24" ga.
- 1-6 Ton Mancha, Std. AN, battery, 24" ga.
- 1-7 Ton Plymouth diesel, w/scrubber, 18" ga.
- 1-8 Ton Plymouth diesel, w/scrubber, 24" ga.

MILLS

- 5-8' x 9' Traylor Ball Mills, 250 H.P. motor
- 3-5' x 14' Marcy Ball Mills, 100 H.P.
- 1-6' x 16" Hardinge Conical, 50 H.P.
- 1-7' x 36" Hardinge Conical, 100 H.P.
- 1-7' x 22" Hardinge Conical, 75 H.P.
- 1-7' x 5' Allis Chalmers, 150 H.P.
- 1-7' x 48" Hardinge Conical, 150 H.P. motor
- 1-5 x 10 Marcy Ball Mill, 100 H.P.

MUCKING MACHINES

- 2-128 Eimco Rocker Shovel. Late Serial, 18"-24" ga.
- 5-GD9 Gardner-Denver 18" ga.
- 1-H13 Sullivan, 18" ga. bargain
- 2-21 Eimco Rocker Shovel, 25" ga.

SCREENS

- 2-6 x 12 Allis Chalmers single deck lowhead.
- 1-3 x 6 Allis Chalmers single deck aerovibe
- 1-3 x 7 Link Belt model PD, single deck.
- 1-4' x 9' Deister Plato, 1 deck, 7 1/2 H.P.
- 3-4' x 12' Tyler Ty-Rock, 1 deck
- 1-4' x 10' Tyler Hammer, 1 deck
- 1-4' x 8' Symons Rod Deck

SHOVELS

- 1-7 yd. Bucyrus Erie, 170 B, electric
- 1-3 1/2 yd. Marion 111M, with Dragline
- 1-20B Bucyrus Erie Shovel with 40' Dragline
- 1-54B Bucyrus Erie with dragline

THICKENERS

- 1-15' x 8' Denver Rake Thickener Less tank
- 1-120' Dorr Traction Type 1-C, 5 H.P.

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Consulting Mining Engineer



Another WADE
Designed and Built

GOLDMILL

Operating data at this mill

Gold Recovery 97 %
Silver Recovery 92 %
3/4 of Gold as Bullion
1/4 of gold in \$1000. per ton concentrates
MILLING COSTS \$1.15 per ton

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16' Gayco Air Separator W/Motor
2-5' x 8' Kennedy Van Saun Air Swept Ball
Tube Mills with disc feeders, fans, piping
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2 Wemco 2M-HMS Plants
5' x 5', 6' x 4' & 6' x 9' Traylor Ball Mills
No. 56 and 7' x 15' Marcy Ball Mills
10' x 48' & 5' x 22' Hardinge Ball Mills
4' x 11' & 7' x 15' Marcy Rod Mills
20' Allis Chalmers Gyratory Crusher
12' x 26", 14' x 28", 18' x 36", 30' x 36",
48' x 60", 66' x 84" & 48' x 72" Jaw
Crushers
8' x 10' Denver Jaw Crushers, rebuilt
24' x 14" & 42' x 16" Type B A.C. Roll Crushers
5 1/2' Symons Std. Cone Crusher
7' Symons Short Head Cone Crusher
78' x 36' 6" Akins Duplex Spiral Classifier
8' x 37' x 19' Dorr Bow Rake Classifier
6' x 50' & 8' x 60' Rotary Dryers
3' x 30', 7' x 120' & 9' x 162' Allis Chalmers
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2-15 HP Inger-Rand 2D Slushers
500-50 ton & 70 ton Gondola Cars
DARIEN, 60 E. 42nd Street, N.Y. 17, N.Y.

Crusher 20 x 36 A-W-Lima rlr-brg
Crusher 10 x 20 Denver Eq. rlr-brg
Crushers 2 Kue-Ken 18" Gyrocone
Apron Feeder 42" x 12 ft. A-W-Lima
Mill 4 x 10 Hardinge rod mill, perph. end dis.
Mill 6 x 4 1/2 Straub grate discharge
Mill 5 x 10 Allis-Chalmers
Mill 5 x 6 Colo. I. Wks.
Mill 5 x 4 Eimco w/new ball charge
Flotation 6-Cells 56 x 56 Wemco-Fog
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Samplers 60" & 28" Vezin standard type
Jig 24 x 36 Denver Mineral duplex

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1-Allis-Chalmers 7' x 120' kiln, 3/8" welded
2-8' x 150' rotary kilns, 1/2" shell
1-Vulcan 10' x 11' x 175' kiln, 13/16", 2-tire
2-National 10' x 78 dryers, 3/4" shell
2-Hardinge 8'-8" x 70' dryers, 5/8" welded
2-Davenport 8' x 60' dryers, 7/16" welded
2-8' x 56' rotary kilns, 1/2" welded
3-Stearns-Roger 8' x 40' dryers, 1/2"
1-7'-6" x 63' rotary kiln, 1/2" welded
1-7' x 6' x 100' rotary kiln, 1/2" shell
2-Bonnet 7' x 60' dryers, 5/8" shell
2-Vulcan 7' x 54' dryers, 1/2" shell
1-Bonnet 6' x 52' dryer, 5/16" shell
2-4'-9" x 32' rotary dryers, 3/8" shell

MILLS - PULVERIZERS - CRUSHERS

1-Symons 2' standard cone crusher, 30 HP.
1-Farrel 36" x 15" jaw crusher
1-Buchanan 24" x 13" jaw crusher, 50 HP.
1-Denver 5' x 10' rod mill, 150 HP
4' x 10' rod mill, 60 HP
1-Allis-Chalmers 5' x 5' ball mill, 75 HP.
1-Raymond 50", 5-roller hi-side mill
3-Allis-Chalmers 5' x 22' ball-tube mills

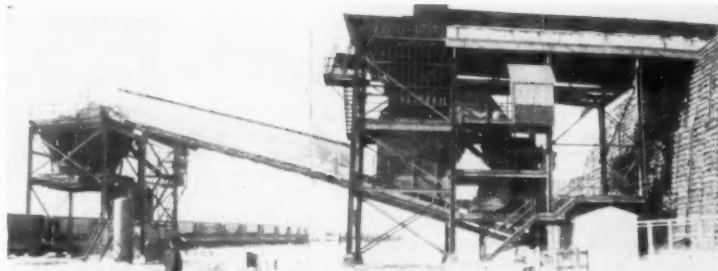
PERRY EQUIPMENT CORP.
1429 N. SIXTH ST.
PO-3-3505 PHILADELPHIA 22, PA.

FAN: Jeffrey Aerodyne, 7' dia., 200,000 CFM, 250
HP motor, 1170 RPM. 16 groove pulley, 2300
volt, 3 phase, 60 cycle, complete with control.
New 1958, used one year, condition like new.
SCREEN: Leaky heavy duty, type D, single deck, for
wet process. New condition.
CONCENTRATING TABLE: Deister #6 super duty.
New condition.
JAW CRUSHERS: A-C 40 x 42" complete with or
without motor and drive, also with or without
Telsmith heavy duty Feeder 42" x 14'3" with
speed reducer and drive. A-C 18 x 30" sectional-
ized for underground use.
GYRATORY CRUSHER: Telsmith 16-B, all steel.
ROLL CRUSHER: Pioneer size 54 x 24", roller bear-
ing equipped, used on one job.
AIR COMPRESSOR: I-R class PRE2, 4500 CFM, 787
HP synchronous motor, 3 phase, 60 cycle, 2200
V. 150 RPM.
SUBSTATION: One G. E. 3750 KVA consisting of
three 1250 KVA, 66000/2400/4150Y with two
G. E. 600 amp., 2300 volt ATF switch houses,
all accessories, including cyclone fence. New 1957.
Condition like new.
HOISTS: One double drum 53" x 36", 75 HP, 550
V. 7/8" rope
One double drum 42" x 36", 100 HP, 550 V.
7/8" rope
One double drum 72" x 31", 200 HP, 2200 V.
1 1/4" rope
One double drum 48" x 36", 200 HP, 2200 V.
7/8" rope
One double drum 72" x 48", 250 HP, 550 V.
1 1/4" rope
One double drum 72" x 54", 300 HP, 2200 V.
1 1/4" rope
One double drum 72" x 64", 400 HP, 2200 V.
1 1/4" rope
One double drum 72" x 54", 400 HP, 2200 V.
1 1/4" rope
One 10' x 10' double clutched drums, 1250 HP,
1 1/2" rope, 1200 FPM
One single drum 60" x 60", 100 HP, 2200 V.
1" rope
One single drum 84" x 63", 150 HP, 2200 V.
1 1/8" rope
One single drum 84" x 63", 300 HP, 2200 V.
2 1/8" rope
One single drum 84" x 63", 450 HP, 2200 V.
2 1/8" rope
One single drum 90" x 72", 700 H.P., 1 1/8" rope.
Other hoists 100-1500 HP for shaft or slope

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OUT NORTH AND CENTRAL AMERICA

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STEPHENS ADAMSON 4 x 16 MANGANESE APRON FEEDER w/motor, drives, like new. Cost
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\$24,000; Sell \$8500
LINK BELT 5 x 14 VIBRATING GRIZZLY SCREEN, type VA, w/motor & drives, like new, cost
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HEWITT ROBBINS 30" x 125' CONVEYOR, lattice frame, w/catwalk, 2' centers between through-
ing rollers, new belting, 40 hp. motor, gravity take-up, like new, cost \$11,000; Sell \$4000
CHICAGO PNEUMATIC 300 CFM STATIONARY AIR COMPRESSOR, w/50 hp. built-in direct drive
motor, accessories, late model, like new \$2850
OR Complete Plant with additional Equipment including: Several hundred tons of STRUCTURAL
STEEL BEAMS 30" to 6"; (2) STEEL BINS 80 cy. & 45 cy. with 1" manganese liners, legs, air
operated gates; ELECTRIC LINE TRANSFORMERS, CONTROL PANELS. Equipment & plant used
one season. Offered at small fraction original cost. Price for all equipment & plant listed
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Gold dredges—Well drills. New and used equipment—all sizes. Complete supplies. Advise your needs. Get our money saving prices. Pressey & Son, Pueblo, Colo.

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E. R. "Bill" WILLIAMS

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MINING GEOLOGIST 8 years varied experience in Western U.S. seeks a position which offers a challenge and where hard work leads to advancement. Resume on request. Write **Mining World**, Box 104, 500 Howard St., San Francisco 5, Calif.

TWENTY MILES of placer ground in British Columbia in established gold-bearing area; drill in area. Martin Mines, Ste. 3, Juniper Lodge, Prince George, B. C., Canada.

FLUORSPAR PROPERTY—70 to 86% CaF_2 . Low silica. 2,000 square feet cross-section orebodies developed so far. 5 to 10 foot width. Flat country. Good roads. 35 miles railroad. \$4,000. C. C. Doyle, Lovelock, Nevada.

Index of Advertisers In Mining World

*Asterisk indicates firms whose products are catalogued in **MINING WORLD'S 1960 Catalog, Survey & Directory Number**

*Alloy Steel & Metals Co.	40	*Magma Copper Company	49
*American Zinc Sales Co.	49	Merrick Scale Mfg. Co.	39
		*Mine & Smelter Supply Co.	44, 45
*Baldwin-Lima-Hamilton Corp.,			
Lima Division	11	*National Iron Company	12
Bemis Bro. Bag Company	29	*National Malleable &	
*Boyles Bros. Drilling Co.	40	Steel Castings Co.	10
*Boyles Bros. Drilling Co. Ltd.	2		
*Bunker Hill Company	31	Timken Roller Bearing Co.	4

Caterpillar Tractor Company

Inside Back Cover

*Colorado Fuel & Iron Corp. 1

*Deister Concentrator Co. 48

*DuPont de Nemours & Co., E. I.,
Explosives Div. 33

*Euclid Div., General Motors Corp. 6

*General Motors Corp., Euclid Div. 6

*Harnischfeger Corp. Inside Front Cover

*Inspiration Consolidated Copper Co. 46

*International Harvester Co. 8, 9
International Smelting & Refining Co. 46

*Lima Div., Baldwin-Lima-Hamilton
Corp. 11

*Wilfley & Sons, Inc., A. R.

Outside Back Cover

MARKET PLACE

Darien	51
Machinery Cents, Inc.	50
Morse Bros. Machinery Co.	50
O'Neill, A. J.	51
Perry Equipment Corp.	51
Pressey & Son	52
Smith, Paul	51
Wade, W. H.	51
Wenzel Machinery Rental	51

SMALL MINE OWNERS—New type wet or dry crusher. Eliminates Ball Mill in most ores. Write W. H. Wahl, 215 Cheyenne St., Golden, Colorado.

LONGYEAR JUNIOR CORE DRILL, Waukesha gas engine powered, mounted on wheels for rapid transport, complete with hoisting tower, high and low pressure pumps, several hundred feet EX rod and high pressure hose. Cash price \$2400. Al Bremer, 18536 Marine View Drive, Seattle 66, Washington.

FOR SALE-LEASE — Million tons or more each deposit. Iron—59%–61%, black and white marble, colorful Wonderstone building rock, Quartzite Silica (SiO_2) 99.84%. Bring your geologist here to view properties and make us an offer! B & D Mining Co. c/o Furnace Creek Ranch, Death Valley, California.

For News

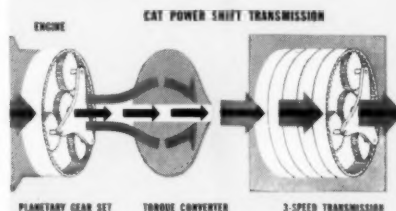
of

Latest Mining

Equipment

See Pages 34-37

of this issue



The exclusive Cat power shift transmission works like this: The engine drives planetary gears in the flywheel, where output torque is divided. Part of it is routed to the transmission through a torque converter (providing anti-stall and load-matching ability). Part goes direct to the three-speed transmission (provides economy and fast response of direct drive). It's one ton of muscle built with the precision of a fine watch.

WITH CAT POWER SHIFT TRANSMISSION IN A D8H, A MAN'S FINGER TIPS CAN CONTROL 30-50% MORE PRODUCTION

Your present equipment may move material at low cost—but here's one reason a D8 Series H Tractor may move it a lot cheaper.

It's the Caterpillar power shift transmission—the only transmission available that combines the advantages of direct drive, torque converter drive and power shifting in a single unit. It greatly increases operator efficiency—offers important new opportunities for broadening your profit margin.

Here's how this big step ahead in transmission design helps your operator get more work from the machine: A single selector lever replaces the familiar master clutch, gear change and forward-reverse levers. Using this single selector lever, the operator can shift on the go in a split-second even under full load. He changes speed or reverses direction with finger-tip ease . . . without clutching . . . without braking . . . without even lifting his arm from the arm rest. And the lever is mounted for left-hand control, leaving the right hand free for maneuvering the tractor or controlling the dozer, ripper or scraper. Convenience makes it easy to choose the right speed at the right moment.

Matching this ease of control are safety features you'll like. A safety lock in the selector housing holds a parked machine in neutral while the engine is running. Another safety device automatically shifts the

selector lever to neutral when the engine is stopped.

The simplicity and safety of the Cat power shift transmission make your good operators even better and less experienced operators more effective. They can take greater advantage of the tractor's power and capacity to speed the work. And ease of operation keeps their efficiency high throughout the day.

Cat power shift transmission also means a big jump in your machine's efficiency too. You'll particularly notice the difference on jobs where frequent shifting is the rule—such applications as feeding a shovel or short-cycle dozing.

For instance, in dozing, the operator starts to pick up the load in second gear—then shifts on the go to first for full lug yardage. There's no clutching, no lost time or momentum when changing speeds. An easy move back to second drifts the material to its destination. Another move of the lever puts the machine in high-speed reverse for fast return to the digging area.

Machine efficiency is *always* high. Cat power shift transmission provides the needed power at the highest possible speed. Its exclusive torque divider design combines the snap and economy of direct drive with the load-matching ability and anti-stall characteristics of torque converter drive—and three forward-

reverse speeds tailor it to the entire working range.

Just how much of an increase will the Cat power shift transmission make on your job? This will depend on your application. On short-cycle dozing, reports in our file show increases as high as 50% over similar-sized machines with other transmissions. Some users flatly state they will never buy another track-type machine in the 200 HP class unless it is a Cat power shift unit.

Power shift transmission is just one reason the D8H may be a far better profit tool than the machine you are now using. There are other features of this 235 HP turbocharged tractor that could be equally advantageous in your work. Your Caterpillar Dealer will welcome the opportunity to discuss the D8H in terms of your job and present facts and figures so you can determine true benefits. And if a demonstration with measured results would help, he will be glad to make arrangements.

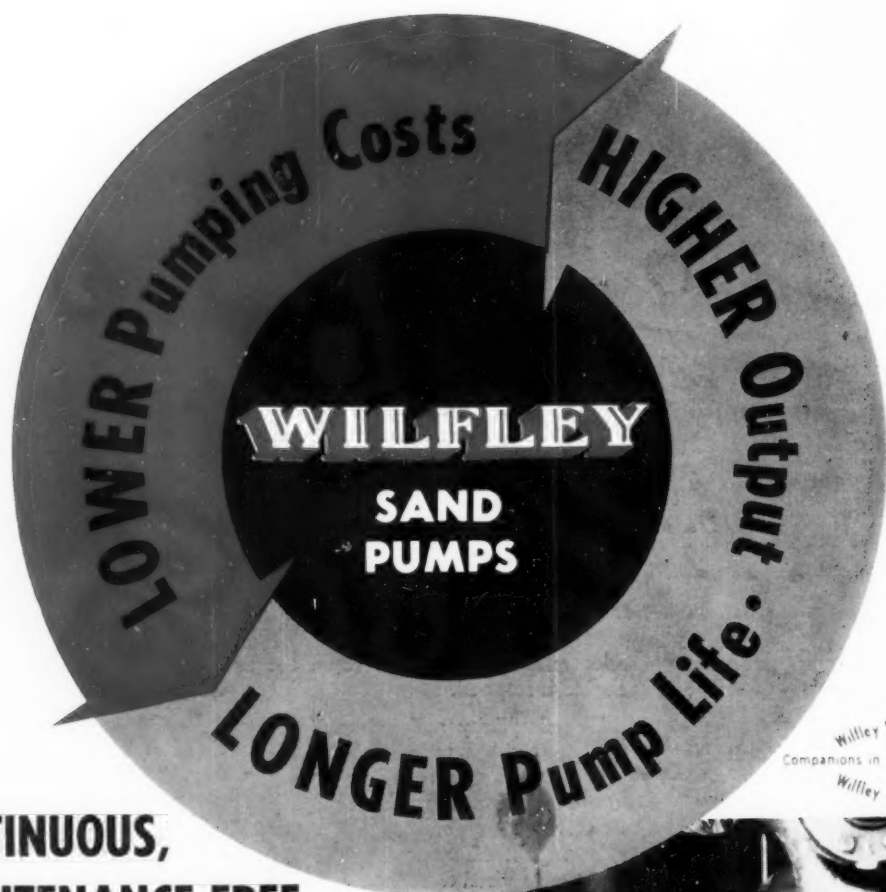
Call him today.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

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**STEP UP PRODUCTION
AND PROFITS WITH POWER
SHIFT TRANSMISSION**



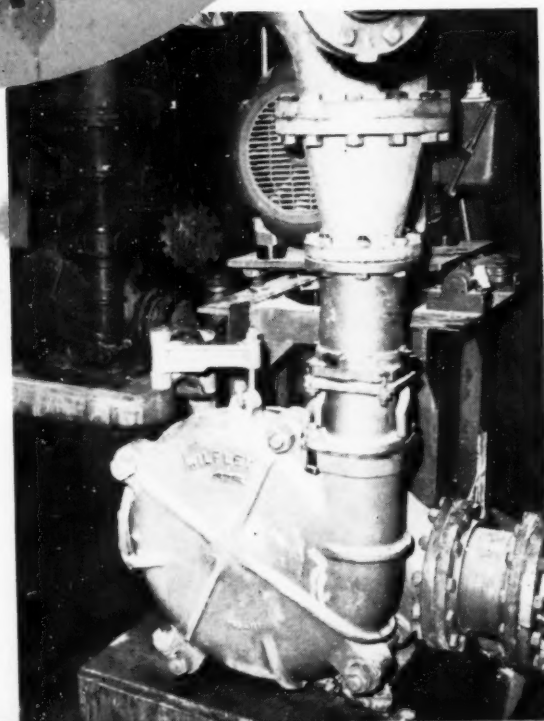
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Wherever you find Wilfley Sand Pumps, you find money-saving performance. Rugged construction and simplified packingless design guarantee 24 hour service without attention. Wilfley's quick-change features allow speedy replacement of worn parts.

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